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FIRST PART.
ORIGINAL ARTICLES

The Present State of Agricultural Education in Austria

by

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In Austria, or rather in the countries represented in the Austrian parliament (Cisleithania), agricultural education is imparted in technical cultural schools and by travelling lecturers. These two forms of tuition not sharply distinguished from each other, for often the teaching staff in schools act as travelling lecturers, while some of the latter hold lectures which resemble those given in the schools, differing from them only in being of shorter duration.

A. — TECHNICAL AGRICULTURAL SCHOOLS.

These schools date back to the eighteenth century. The first of them were founded on the initiative of private persons, some of whom were large landowners who had recognized the necessity of technical agricultural instruction. In the development of agricultural cooperation, the cooperatives (even some of the smaller ones) founded schools of agriculture. Especially in the sixties, this movement became very active and most of the agricultural schools in Austria owe their origin to private initiative, chiefly of agricultural associations.

At first some uncertainty prevailed as to the objects and extent of these schools; only later, in the seventies, did they begin to differentiate according to their several aims. As soon as a Ministry for Agriculture was created in Austria (in 1868) it took an especial interest in agricultural education. After consultation with the most competent persons and institutions the Ministry issued a series of decrees with the object of giving a first organization to agricultural education.

To that period is due the present distinction of higher, medium and lower agricultural schools. This sharp distinction distinguishes the Austrian agricultural school system from that of most countries, in only a very few of which this systematic graduation from the highest to the lowest school has been adopted.

1. *Higher agricultural education.* — In Austria those institutes which give the highest scientific instruction in all the branches of agriculture, in which admit only those pupils who possess a good general preparation and the leaving certificate (*Mittelschulmatura*) of medium schools, are considered as agricultural colleges.

The subjects taught are not only the purely technical ones, but comprise also all those scientific subjects which concur in making up a higher culture. The course has a duration of four years and gives the necessary knowledge for managing large estates and for teaching in colleges and medium schools as well as for scientific research work in agriculture; it also enables students of other professions to gain useful knowledge concerning the cultivation of the soil. At the end of the course there are three State examinations (*Staatsprüfungen*) to be passed. Besides this the students may obtain the academic degree of doctor in agriculture (*Doktor der Bodenkultur*) on presenting a thesis and submitting to severe examinations.

At present the following colleges exist in Austria:

1. Vienna (*Hochschule für Bodenkultur*), consisting of three sections of agriculture, forestry and rural engineering; tuition is imparted in German.

2. Krakau, the agricultural section of the University of Krakau, in which teaching is in Polish.

3. Prague, at the Bohemian University, in which Czech is the language used.

All these three colleges are under the Ministry of Instruction.

Besides these completely equipped colleges there are also agricultural chairs at the following technical colleges: Vienna (German), Graz (German), Prague (German and Bohemian), Brünn (German and Bohemian) and Leiberg (Polish). The object of these chairs is to complete the instruction of the students of the technical colleges, especially of the engineering section.

2. *Agricultural Academies.* — At first, besides the higher education in agriculture, there were only the medium and lower schools. Towards the end of last century an intermediate school has been introduced between the higher and the medium schools; it is called the agricultural academy and imparts instruction as in the colleges, from which it differs in that the course lasts two years, or if desired three years, instead of four. The academy admits pupils from the medium schools of general culture and from agricultural medium schools.

There are at the present time three agricultural academies, which are regional institutions, and like all the following agricultural schools are under the control of the Ministry of Agriculture.

While the Colleges do not possess any farm attached to them, or an experimental one, the agricultural academies have large farms for experiments.

tal and educational purposes, and they give their students the theoretical and practical knowledge required for the management of large estates.

3. *Medium Agricultural Education.* — The students who have been through the agricultural medium schools are also capable of managing large and moderate-sized estates, and they can, as well as those from the families, on conforming to the regulations, become teachers in the lower cultural schools. These medium agricultural schools are open to all who have passed the lower four classes of a middle school for general culture or the classes of a secondary school (Bürgerschule).

Instruction in these schools is chiefly theoretical, but where possible practical tuition is also given, as almost all of them dispose of a completely equipped school farm. Students who have obtained their diploma may, on passing an examination before a commission in the presence of a government official, be admitted as one-year volunteers in the army.

There are at present in Austria nine medium agricultural schools; in of these German is spoken, in four Bohemian and in one Polish. With one exception they are regional institutions. There are, besides, two special schools, one of which is the Klosterneuburg higher school for vine and fruit growing, which is a State institution, and the other the horticultural school at Eisgrub, a private institution, but subventioned by the State officially recognized.

4. *Elementary Agricultural Education.* — The number of lower agricultural schools is much greater than that of the above-mentioned schools. Its object is the spread of agricultural knowledge among the peasant population. At first there were only elementary agricultural schools for boys. It such were opened also for girls.

In some schools for boys the course is a two-years one (Ackerbauschule), whereas its duration is only of one or two winter half-years (Winterschulen). The first are the oldest, and they receive pupils who possess the general education that is given in the primary schools (Volksschulen); theoretical and practical instruction (the latter on the school farm) are given. The object of these schools is to form a class of better educated peasants and also overseers and foremen for large estates.

The number of these schools is forty-two, of which thirteen are German, fifteen Bohemian, seven Polish, two Slovenian, two Italian and fourugian.

The number of agricultural winter schools is constantly increasing, and among the schools for the peasantry they have proved to be the best. As the winter schools are open only during the five or six months of the worst weather and as but few of them possess a school farm, the instruction given is purely theoretical and includes subjects of general education as well as agriculture. The commencement of the courses is regulated according to the climatic conditions of the locality. In most of the winter schools a second winter course follows the first, so that in reality the course covers ten to twelve months.

In general such good results have been obtained with the two-course winter schools that at present the tendency is to found two-course winter

schools and to convert into such the one-course schools. For admittance them the pupils must possess the elementary knowledge given by primary schools. The pupils work during the summer, between the two courses, their fathers' farms; with the present scarcity of rural labour this is an advantage. After having frequented these schools they generally remain, their parents' farm, in the improvement of which they use the acquired knowledge, and at the same time set an example to their neighbours.

In 1913 there were 91 winter schools; some are regional, others association or private institutions. There are, besides, some schools which are similarly organized, but which devote themselves to some special branch such as vine-growing or market gardening.

Such special branches are also treated in some lower schools in a one years' course lasting ten or twelve months or less. Their object is to impress pupils in market gardening, fruit or vine growing, in the cultivation of hops or meadows, and in dairying or other special branches of agriculture; consequently they have been founded where these particular forms of farming are prevalent. Their number is now 24.

5. *Agricultural Instruction for Girls.* — In the nineties the opinion began to gain ground that instruction limited only to boys was not sufficient because in farming in general, and especially in some branches, the influence of the women in the family is very great. Thus the necessity of providing technical instruction for women also was recognized and the first housekeeping schools were founded with the object of teaching farmers' daughters the domestic management of a farm house, together with some notions of agriculture. These schools are not all of them organized on the same lines. There is one housekeeping school which bears the title of agricultural school for girls. In order to be admitted to it a fairly good preparation is demanded, such as is given by the secondary schools (Bürgerschulen), training schools for teachers or high schools. Besides housekeeping it teaches agriculture systematically, the curriculum being about the same as in the practical schools of agriculture (Ackerbauschulen), so that the girls on leaving the school are not only qualified to manage a large farm household, but can also act as assistants on a farm or teach in agricultural housekeeping schools.

The other agricultural housekeeping schools, which demand as preparation for admission only the knowledge acquired in the elementary schools, are divided into those whose course extends over a whole year and those which it is limited to five or six months.

Besides the above, there are also the so-called summer housekeeping schools attached to the agricultural winter schools. They have the same subjects in view as the housekeeping schools and a similar curriculum, but differ chiefly in the shorter duration of instruction (three to five months) as well as in the time of year during which they are open, generally April 1.

The most important data on the agricultural schools as they were during the scholastic year 1912-13 are the following:

Institutions for Agricultural Education in Austria.

Institutions	State	Regional	District or association	Private	Total	Staff		Number of students	Scholarships	
						Perma- nent	Admir- able		Number	Yearly amount
Colleges and Sections of Universities	3	—	—	—	3 ¹⁾	92 ¹⁾	58 ¹⁾	1 631 ¹⁾	1 47 ¹⁾	£ 2 774
Colleges	—	3	—	—	3	52	19	342	64 ²⁾	£ 1 606
Technical schools	1	8	1	1	11	97	60	1 274	103	£ 1 172
Primary schools	1	26	13	1	41	169	186	1 486	484	£ 4 530
Winter schools	—	55	33	3	91	251	610	3 370	921	£ 2 753
Special schools	—	19	14	1	34	110	99	868	240	£ 1 794
Housekeeping schools, 1½ years' course	—	—	—	1	1	6	8	22	—	—
Housekeeping schools	—	4	13	5	22	100	63	630	44 ³⁾	£ 277
Total	5	115	74	12	206	785 ¹⁾	1 045	7 992	1 856	£ 12 132

(1) In the expenses of the colleges those of the forest section and of the rural engineering sections of Vienna agricultural school are included; for this reason these expenses are not comprised in total.

(2) Including 12 free places.

(3) In the last budget only two extraordinary grants of £ 96 are included.

— TRAVELLING AGRICULTURAL LECTURESHIPS AND SPECIAL COURSES.

Travelling agricultural school education is, under present conditions, possible for only a limited number of intending farmers. Consequently it is sought to use other methods besides schools to promote the spread of agricultural instruction. These methods are travelling lectureships and special courses. The lectures are given either by travelling lecturers specially engaged for the purpose or by some of the teachers of agricultural schools, both classes of lecturers visiting in turn the various localities of a district.

While the travelling lecturers in the southern districts, such as Dalmatia and Illyria, which are less developed from an agricultural point of view, are engaged by the State, in all the other parts of the Empire they are officials of independent local authorities or of the principal agricultural corporations and associations; nevertheless the State contributes in most cases towards their salaries.

For all the crown lands, regulations have been drawn up for the carrying out of this service.

As the effect of a lecture is in general but slight, the lecturer is bound by the regulation to keep himself posted in the progress of his territory, to keep in touch with the rural populations and to assist the people with advice in any difficulty connected with farming.

Among the duties of the lecturer there is also the holding of courses which may last a day or more, in order to instruct farmers, anxious to learn in certain branches of agriculture, such as dairying, live stock keeping, poultry keeping, fruit tree grafting, forage growing, etc. Such courses are often held by teachers of the winter or other agricultural schools during their free time, either in the same schools or elsewhere, and contribute effectively to the spread of modern farming methods. These courses are not limited to the men and boys only, but extended under the form of lectures on cooking and domestic economy to the women also.

All the members of the teaching staff, whether travelling or otherwise, must before being definitely appointed pass an examination as to aptitude for teaching. This examination is held at one of the colleges in Vienna or in Prague, and is divided into an examination for medium schools and for lower schools. There are, besides, examinations for fruit and vine growing and for agricultural housekeeping schools. For these examinations there are special regulations drawn up by the Ministries for Education and Agriculture.

As agricultural instruction in Austria is not all under one single control but is managed partly by the State and partly by other bodies, such as governments, district municipalities, associations and even by private persons, it is not easy to ascertain the amounts of the sums spent for this or that. Nevertheless, from the following data concerning the expenses and contributions of the State, which form only a small part of the whole, some idea of the outlay may be formed.

The budget for 1913 contains the following figures:

1. In the budget of the Ministry of Instruction, under whose control all the Universities and Colleges are situated, consequently also the cultural sections of the Vienna College, of the Czech Polytechnic of Prague and of the University of Krakau, the allotments for agricultural instruction are not given separately, but only the lump sums for each institution. Nevertheless these figures show the amount of the contribution of the State for this branch of education.

In the budget for 1913 the estimates for the Vienna College are set down at £. 28356, of which about one half may be considered as devoted to the agricultural section. There is besides a special credit of £. 1742 provided for Higher agricultural education shares also for an amount which is not stated in the sums voted for the Czech Polytechnic of Prague, *viz* £. 57078 ordinary expenses, and £. 18892 extraordinary ones, and in those of the Krakau faculty of philosophy, namely £. 31 450. Of these sums between one-half and one-third may be safely reckoned as being spent upon agricultural education. It is also to be noted that the cost of the chairs of agricultural

the Polytechnic schools of Vienna, Gratz, Prague, Brünn and Lemberg go to be included in the sums spent on higher agricultural education.
2. In the budget estimates of the Ministry of Agriculture, upon which the other schools of agriculture depend, the following figures are included:

1) For the State Institutes of Klosterneuburg, Spalato and Glavica, ordinary expenses	£ 10 046
Extraordinary do	" 83
Total	<u>£ 10 129</u>

2) For grants to agricultural schools not belonging to the State, as well as for travelling lectureships and special courses, ordinary expenses	£ 28 750
Extraordinary do	" 15 000
Total	<u>£ 43 750</u>

3) For the spread of means for agricultural instruction, for scholarships, subventions, travelling expenses, expenses for State inspectors of subventioned schools, for the commissions of examiners of teachers of agriculture and forestry, ordinary expenses . . .	<u>£ 8 333</u>
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4) For travelling lecturers and special courses, which are partly (in Dalmatia and Illyria) instituted by the State and to a greater extent by the local Governments and by the principal agricultural associations, further for the cost of agricultural instruction to soldiers and for the upkeep of model farms, ordinary expenses	£ 15 417
Extraordinary do	" 4 167
Total	<u>£ 19 584</u>

According to the above the total outlay of the State for agricultural education, excepting college education, is:

1) For State Institutions	£ 10 129
2) For subsidizing institutions not belonging to the State . . .	" 43 750
3) For general agricultural education	" 8 333
4) For travelling lectures and special courses	" 19 583
Total	<u>£ 81 795</u>

From these figures it may be seen that the State takes a special interest in agricultural education; by comparing them with those of the previous year it will be seen how rapidly the outlay for this object has increased. The increase is explained not only by the increased number of institutions (for instance, in 1912, eight new ones have been opened), but also by greater demands of efficiency made upon them.

Recent Work of the Bacteriological Section
of the Central Agricultural Experiment Station
at Experimentalfället, near Stockholm

by

CHR. BARTHEL,

Chief of the Section.

The Bacteriological Section undertakes research and experiments agricultural microbiology in general. This work includes the bacteriology of the soil, of manure and of dairy produce; the subjects are often treated in conjunction with other sections of the institute.

The work on soil microbiology has been concerned with methods investigation, and more recently with the influence of organic substances on nitrification and denitrification in the soil. Just now, the decomposition of farmyard manure in the soil, both alone and in presence of lime, is occupying attention. The changes of a biological nature induced in the soil by farmyard manure have so far been insufficiently explained.

In collaboration with the Botanical and Agricultural Sections, numerous trials have been made with different cultures of Leguminous-rod organisms, such as Bottomley's "Nitrobacterin", Simon's "Azotogen" and cultures prepared by us. "Nitrobacterin" contained no living *radicicola*, and consequently produced no effect; "Azotogen" gave very good results and the results of experiments with the cultures prepared in our own laboratory were likewise satisfactory.

On the subject of the fermentation of farmyard manure, work has been undertaken in collaboration with the Agricultural Experiment Station on the possibility of preserving the ammoniacal nitrogen of the manure by the addition to it of whey from cheese-factories. Some years ago it was shown that the common lactic ferments occurred in great numbers in farmyard manure; by supplying them with carbohydrate material, such as milk sugar, one ought to get a fermentation in which the acids produced fix the ammonia of the manure, thus preventing the usual loss of nitrogen in this form. Chemical and bacteriological analyses, as well as field trials carried out by the Agricultural Section of the Institute, have shown that this treatment of manure (0.25 and 0.5 per cent. of milk sugar being added) has the expected effect, and the manure gives considerable increase of crops when manure kept in the ordinary way.

Bacteriological work on dairy questions has also taken up a good deal of time.

Firstly, a satisfactory method for judging the quality of dairy products from the hygienic standpoint was sought for. The reductase test was

swer the requirements in this case. It is very easy to carry out and a very fair approximation of the number of micro-organisms present in milk. The result has been that the method has spread widely, both in Denmark and in other dairy countries. In the Swedish dairies, where the milk is now beginning to be fixed on its hygienic qualities, as well as on the fat-content, the reductase test is used as the basis for the former. Other work was dealt with: anaerobic organisms of milk and butter; influence of heating of tubercle bacilli in whey (in view of a projected measure of compulsory pasteurization of waste dairy products); biology of the bacilli, especially with regard to the part they play in the ripening processes; influence of different methods of pasteurization on the micro-organisms of milk; bacteria of slimy milk.

These researches are often not confined to the bacteriological laboratory, but are also made in various dairies, so as to bring them under the conditions of practice.

Besides this work, of which the results have been published in the Bulletin of the Central Institute, as well as in various scientific journals in different countries, a great number of bacteriological analyses have been made in charge on samples of milk, butter, cheese, water used in dairies, etc., sent in by private persons. Consultations on questions of agricultural microbiology are also given free.

Organization of Field Experiments in Denmark

by

H. C. LARSEN,

Secretary of the State Commission for Field Crops at Copenhagen.

Experiments on crops have been carried on in Denmark since the middle of the nineteenth century. When the *Royal Agricultural and Veterinary College* ("Den Kgl. Veterinaer og Landbohøjskole") was founded about 1870, 25 acres of the land belonging to it were set apart as an experimental field; on this experiments were begun on a plan similar to that of Rothamsted Experimental Station. These experiments went on for more than thirty years. From 1882 to 1903, a Commission nominated by the *Royal Agricultural Society* ("Det Kgl. Danske Landhusholdningsseminarium") carried on extensive experiments on cereals, particularly wheat and barley; these were made in various parts of the country and were aimed at determining: the varieties best suited to the climatic conditions of the country, best date for sowing, amount of seed, time of harvest, method of sowing, etc. In 1894 Local Agricultural Societies began experiments on the land of their members, practical farmers; this work has extended so that each year more than 2000 experiments are made, under the auspices of about 120 societies in all parts of the country. The results of

these experiments are generally only of local value, and indeed are only applicable to the field in question; in the earlier years they were mostly concerned with the use of chemical manures and the manure requirements of the soils; later they were extended to almost all points of field practice. By statistical elaboration of the mass of material for a year's experiments, the results have been made useful in various branches of agriculture in a way that was not previously possible.

The *Government crop experiments* ("Statens *Forsøgsvirksomhed i Landkultur*") were begun after 1870 by P. NIELSEN, State consulting specialist under the auspices of our Royal Agricultural Society. They are essentially based on *fixed field experiments*, whose results, separately or combined, can be considered of value for the whole country, or at any rate for large areas. This branch was made into an independent State institution in 1886 by the establishment of an experimental station at Tystofte.

The following *permanent Government crop experiment stations* now exist:

1. *Tylstrup*, in northern Jutland (Vendsyssel); established in 1870; area — 91 acres of sandy soil, 91 acres of fen (*Carex* moor), 128 acres of peatmoor (*Sphagnum* moor).

2. *Studsgaard*, in central Jutland; established in 1896; area — 100 acres of light sandy soil ("grass heath"), 37 acres of sandy soil at B (western Jutland), 27 acres of fen, 54 acres of peatmoor near Horsens.

3. *Aaskov*, in southern Jutland; established in 1886; area — 57 acres of clay, 17 acres of sandy soil, 15 acres of peatmoor.

4. *Aarslev*, in Fünen; established in 1905; area — 82 acres of clay.

5. *Lyngby*, in north-east Zealand; established in 1890; area — 50 acres of clay.

6. *Tystofte*, in south-west Zealand; established in 1886; area — 40 acres of clay.

The *sub-stations* are as follows: *Abed*, in Læaland (5 acres of good soil) and *Aakirkeby*, in the island of Bornholm (7 1/2 acres of heavy clay).

Temporary experiments, made on a fairly large scale, comprise: growth of root crops, diseases of plants and their control.

With these experiments are combined chemical, botanical and bacteriological researches, carried out in the *State Field-crop Laboratory* ("Statens *Planteavlslaboratorium*") at Copenhagen, as well as in the other laboratories of the permanent stations.

The *Danish Seed Control* ("Statanstalten *Frekontrol*") was established by the State in 1871; this institution assists in the experiments by controlling the seed used in the trials.

In the *State experiments*, the method to be followed is fixed especially with regard to the *position of the stations* and the *nature of their land*. As mentioned above, three of the six permanent stations are in Jutland, three in the large islands, while the smaller islands have two sub-stations. The country is thus divided into naturally bounded districts, in which the soil and climate are in agreement with those of the stations; in each district the land for the experiments has been chosen to have soils as far as possible for the regions under consideration (clay or sand, fen or

As the results of the experiments carried out at each station depend essentially on the soil and climate, this method guarantees them the greatest possible value for the agriculture of the district; and as they are, owing to their nature, carried out simultaneously at several or all of the stations, the conclusions drawn from them rest on as wide and solid a base as possible. This is particularly important in comparative trials with different varieties of crops and in experiments on seed yield, time and method of sowing, cultivation, rotations, etc.

Before a piece of land is selected for experiments, the conditions and evenness of the soil are very carefully gone into; uniformity is an indispensable condition of land for experiments. Numerous samples of soil and subsoil are taken according to a pre-arranged plan and at definite distances apart; these are judged and submitted to physical and chemical examination. Then the experimental ground has been chosen, the whole is given a trial cultivation by the same methods and under the same crop, generally for several years, so as to work out any possible irregularities due to previous cropping; the soil is thus made uniform. At the same time, the uniformity is tested by weighing the produce of plots not larger than those which will eventually be laid down. The large amount of material obtained from these preliminary investigations allows a very exact estimation of the evenness of the land to be obtained, and serves for the arrangement of the experiments, the classification of the soils, and the setting-out of the fields and plots for the different experiments. The management of the plots is also arranged so that any differences due to the experiments themselves are equalized before fresh experiments are started.

In Denmark, as elsewhere, the disturbing influence of variations in soil is further guarded against by arranging a large number of parallel plots, arranged in size, shape and position in such a way that their average uniformity may be supposed to be the same as that of the whole field. The number of parallel plots is generally from 6 to 12; for manuring experiments they cover 4 to 2 rods ($\frac{1}{40}$ to $\frac{1}{80}$ acre); for trials of various seeds and crops, rods to 12 sq. yds. ($\frac{1}{80}$ to $\frac{1}{400}$ acre); for pasture plants, 1 rod to 6 sq. yds. ($\frac{1}{160}$ to $\frac{1}{320}$ acre). The smaller the resulting figures from an experiment, and the less the evenness of the land, the greater must be the number of parallel plots. With variety-trials the number often reaches 12 and sometimes exceeds 20 (1). The influence of two adjacent plots on one another may be avoided by establishing a sort of protecting belt all round the plot, and weighing only the produce from the part thus enclosed.

The exactness of working may be examined and checked by a calcu-

(1) In working with different varieties of cereals, the seed samples are all taken from the same spot and under similar conditions. In root crops, especially in comparing varieties, the percentage of dry matter is considered as of prime importance; to determine this four large samples are taken from each parallel plot for each variety, each sample consisting of at least fifty roots; all these roots are cut across four or five times to get a pulp for analysis. The dry matter is calculated from the mean of the four analyses.

lation of the probable error on the materials used, and this can be made as well while the experiments are in progress as when it comes to working up the results for publication. But nothing is published till the results admit of no possible doubt. The experiments are carried on for at least five years, and often for a much longer period before the results are considered fit for publication. Experiments on manuring for rotations thus last over two or three courses, making 16 to 24 years. In this way the influence of the different seasons is largely eliminated, in most cases a necessary condition for obtaining reliable results.

The organization and direction of the State activity as regards experiments is under the control of the Ministry of Agriculture. The permanent *Experiment Stations* are organized as ordinary farms as far as the experimental work permits. Each station is under a *director of experiments* further, two such directors have charge of the temporary experiments. The directors engage the staff and are nominated and dismissed by the Minister of Agriculture on the advice of the *State Commission for Field Crops* ("Statens Planteavlsværdvalg"). This Commission acts as intermediary between the Minister and the State activity on field crops; it sits at Copenhagen and is composed of three members nominated respectively (subject to the approval of the Minister) by the Royal Agricultural Society (whose delegate acts as Chairman), by the governors of the Royal Agricultural and Veterinary College and by the Agricultural Societies which cooperate in the work.

The Budget fixes every year a detailed *plan of work* for the State experimental activity, with details for carrying out the experiments and researches proposed; these number over 200 each year. The directors of experiments discuss the experiments to be made with the representatives of the local experimental organization and also with those of other institutions which collaborate in the work; they then together make up a plan of work which is sanctioned by the State Commission after joint discussion and possible revision; after this the directors are solely responsible for carrying them out. A copy of the results is sent in each year to the archives of the Commission and is used for the working out of the results. The directors themselves undertake this work; for each series of experiments a *reporter* is nominated; when the series is finished he balances the results and draws up his report. This report is agreed to by all the directors and then published by the State Commission in the *Annals of the Production of Field Crops*; this is the organ of the experimental activity, and is edited by the secretary of the State Commission. *Summarized popular reports*, drawn up in the same way, are published as special leaflets and in the newspapers to bring the results of the experiments before farmers; they are distributed free in large numbers in railway stations and agricultural schools, and at meetings, shows, etc. These summaries are also published in the *Annals*.

also give reports and extracts of reports on the local experimental control of Danish seeds, etc. (1).

The *organisation and direction of the local experimental activity* is undertaken by the local Agricultural Societies or their federations. The plans elaborated and directed by *Local Crop Commissions* and are carried out by consulting specialists named by them, or at any rate with the assistance of these. The different Local Commissions in each Province work together, holding a joint meeting once a year; at this meeting a complete report on the results of the experiments made in the province is presented, the problems and plans for the experiments of the coming year are discussed. The four Provinces of Jutland, Fünen, Zealand and Lolland-Falster, each have also a Crop Commission nominated by the societies working in the work, with a consulting specialist for the subject. The *Provincial Crop Commissions* direct the joint work of the Local Commissions, collect and publish their reports, and through their consulting specialists organize and direct the experiments and researches of special interest for the province or the country in general. In the case of experiments of general interest the matter is discussed at the annual meetings of the Provincial Commissions and between these and the State Crop Commission, the State directors of experiments, etc.

The annual *State grants* are as follows: for the State experimental activity, about 200 000 crowns (£11 000); for the local experimental activity, about 100 000 crowns (£5 500). The latter is allotted on condition that the Societies themselves contribute more than one-half of the total expenses of experiments.

The Possibility of Replacing Stassfurt Potash Salts by Finely Ground Phonolite Leucite, etc.

by

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CONSUMPTION AND EXPORTATION OF STASSFURT POTASH SALTS.

Before examining the question of the possibility of replacing the Stassfurt potash salts by other minerals it is necessary to know what quantities these salts are produced and consumed.

1) Subscriptions for the *Annals* may be sent to the "Gyldendalske Boghandel", Copenhagen; the price for one volume (yearly) is 6 crowns (6s 7d).

LEMMERMANN

The total production of potash salts (crude) in Germany was (1):

In 1910	8 031 838	tons
In 1911	9 553 144	"

The manufacture of concentrated salts from the crude material in the same years and in the same country was as follows (2):

Year	Chloride of potash	Sulphate of potash	Sulph. of potash and magnesia calcinated 48 %	Potash salts for manure	Sulph. of potash and magnesia 40 %	Kieserit in blocks	Caking potash
	tons	tons	tons	tons	tons	tons	tons
1910	427 382	91 735	40 873	516 581	105	29 382	7
1911	436 352	108 383	48 239	635 522	141	29 700	7

The quantities used in Germany for agricultural purposes were following (2):

Year	Crude salts	Containing pure potash	Manufactured products	Containing pure potash	Total	
					Salts	Pig
	tons	tons	tons	tons	tons	tons
1910	1 923 623	249 646	261 176	104 012	2 184 800	333 6
1911	2 168 335	285 294	324 739	130 374	2 493 074	415 6

The quantities of crude salts exported amounted to (2):

In 1910	1.16	million tons
In 1911	1.13	

The greatest quantity (709 600 tons in 1910 and 631 900 tons in 1911) was exported to the United States. Next in importance are the Netherlands with 140 700 tons, followed by Russia with 67 000 tons.

(1) According to Dr. M. HOFFMANN: *Arbeiten der Deutschen Landwirtschafts-Gesellschaft* 1910, Part 216.

(2) According to Dr. Hoffmann: *loc. cit.*

The quantities of chloride of potash exported were (1):

In 1910	266 000	tons
In 1911	325 000	"

The chief importing countries were:

	In 1910	In 1911
United States	177 000	219 500
France	34 400	39 200
England	14 600	13 900
Spain	8 600	11 700

The exports of sulphate of potash were (2):

In 1910	74 800	tons
In 1911	108 000	"

The following quantities were shipped:

	In 1910	In 1911
	— tons	— tons
To the United States	39 070	56 100
" France	8 560	14 860
" Spain	3 250	5 610
" Ceylon	2 230	3 710
" Japan	414	1 480
" Algiers	1 052	1 820

The amounts of sulphate of potash and magnesia exported in 1911 were 278 500 tons, of which 140 700 tons went to North America, 108 000 tons to the Netherlands and 31 500 tons to Sweden.

The table on the next page shows the quantities of potash consumed by the whole world (3):

From the above statistics it will be seen that very considerable quantities of Stassfurt salts are used and that their consumption is on the increase. Besides the so-called Stassfurt salts which contain potash in a soluble form (KCl or K_2SO_4) and which hitherto have been found and worked in quantities only in Germany, other minerals containing potash are found in considerable masses in other parts of the globe. Such are the silicates containing potash: phonolite, leucite, sanidine, muskovite, feldspar, etc. For a long time past attempts have been made to use these salts as manures.

According to Dr. GROSSMANN. Die Ernährung der Pflanze. — *Illust. Halbmonatsschrift* II (1912), No. 6.

According to Grossmann, *loc. cit.*

According to Dr. Hoffmann, *loc. cit.*

Country	Total potash in tons	Consumption in lbs. per acre
1. Germany	353 835	9.12
2. United States	241 351	1.30
3. Belgium	8 845	4.24
4. Holland	28 934	12.89
5. France	22 482	0.511
6. England	9 778	1.29
7. Scotland	5 804	3.55
8. Ireland	2 754	1.15
9. Austria	11 628	0.731
10. Hungary	1 321	0.066
11. Switzerland	2 733	1.10
12. Italy	5 512	0.308
13. Russia	14 318	0.70
14. Spain	7 232	0.297
15. Portugal	778	0.154
16. Sweden	16 364	4.24
17. Norway	1 733	2.74
18. Denmark	4 298	1.54
19. Finland	966	0.73
20. Other countries	14 282	—

VALUE OF PHONOLITE AS MANURE.

Of late especially, efforts have been directed towards the introduction of phonolite into agricultural use, for it was believed that it could compete with the so-called Stassfurt salts; as quite recently many experiments have been conducted to ascertain the foundation for the above belief it is now possible to give an opinion based on facts as to the real value of this mineral. Phonolite is a leucitophyre and consists chiefly of nosean, sandalite, nepheline, leucite, augite and biotite. It contains an average of 9 to 10 per cent. of total potassium (of which 33 per cent. is soluble in hydrochloric acid).

id, while only traces are soluble in water), 6 to 8 per cent. of sodium, 2 to 3 per cent. of lime and magnesia, 25 per cent. of oxide of iron and alumina and 50 per cent. of silica.

When phonolite meal was placed on the market, a number of papers were published, especially by WEIN, with the object of demonstrating the good effects of phonolite. As the cause of their useful action, said to be due to that of the Stassfurt salts, the easy weathering of the stone was mentioned as rendering potash available in sufficient quantities.

But many control experiments carried out by impartial workers have failed to confirm these favourable results.

When PFEIFFER and his collaborators (1) compared the effects of phonolite with those of sulphate of potash by means of pot experiments in sandy soil, they obtained the following results. The figures refer to the excess of crop over the pots left without potash manures.

				ratio
By 1 gm. of K_2O as K_2SO_4 :		29.49 gms. of oats	\pm	2.49 100
» 1.087 » phonolite:		11.82 » »	\pm	2.81 40
» 2.174 » K_2SO_4 :		40.33 » »	\pm	2.84 100
» 2.174 » phonolite:		19.75 » »	\pm	2.29 49

According to the above the utilization of the potash contained in phonolite was much inferior to that in the sulphate of potash, being as 9.7 to 88.2. Similar results had been already obtained by other experimenters.

Thus WAGNER (2), in pot experiments comparing sulphate of potash with phonolite for rye-grass, found the following quantities of excess crop over the controls without potash:

On sandy soil			On peaty soil		
ratio			ratio		
By 2.5 gm. K_2O as K_2SO_4 :	21.9	100	73.2	100	
» 2.5 » phonolite:	10.1	46	24.1	33	
» 3 » K_2SO_4 :	29.3	100	85.6	100	
» 3 » phonolite:	8.5	29	39.2	46	

The utilization of potash was as 100 : 11 on sandy soil and as 100 : 14 on peaty soil.

SCHEIDEWIND (3) also found throughout a considerably smaller effect of phonolite in comparison with chloride of potash. The ratio of the

(1) PFEIFFER, BLANCK and FLEISCH: Die Bedeutung des Phonoliths als Dungemittel. *Mitt. Landes Inst. Breslau*, Vol. VI, Part 2, 1911.

(2) Deutsche Landes. Presse, p. 1, 1909.

(3) Versuche über die Wirkung des Kainits 40%iger Kalisalze und Phonolite. — *Arbeiten Deutschen Landwirtschafts Gesellschaft*, 1911, Part 193.

effects of equal quantities of potash given under the forms of chloride of potash and of phonolite were as follows:

	Chloride of potash	Phonolite
Potatoes	100	33.9
Spring wheat	100	34
Mixed clover and grasses	100	20.3

The utilization of the potash contained in the two manures was the following:

	Chloride of potash	Phonolite
Potatoes	100	24.7
Spring wheat	100	4.1
Mixed clover and grasses	100	10.8

Experiments on vegetation carried out by HEINRICH and HONCAMP showed that the effects of equal quantities of potash under the form 40 per cent. potash salts and of phonolite were respectively as follows:

	40 % salt	Phonolite
Barley (grain)	100	36
" (straw)	100	36
Peas (grain)	100	31
" (straw)	100	42

The utilization of the potash in the phonolite was with barley 14 cent. and with peas 20 per cent. of that of the 40 per cent. potash salt. These careful experiments show that the potash contained in phonolite undoubtedly a certain action, but that this is notably inferior to that exerted by easily soluble potash salts.

The results obtained by the easily soluble potash salts, contrary to statements of interested parties, are not attained when phonolite is not mixed with the soil but given as a topdressing, as, for instance, was done in Pfeiff experiments. As for the other available trustworthy experiments, they do not offer data differing to any extent from the preceding ones.

In the open field phonolite does not in any way have the same effect as the Stassfurt salts. This is clearly shown by the experiments made SCHNEIDEWIND (*Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, 1st Part 193), TACKE (*Protokoll der 64. Sitzung der Zentralmoorkommission*), and *Illust. Landw. Zeitung* 1910, No. 3), v. FEILITZEN (*Mitt. der Deutschen Landw. Gesellschaft*, 1910, page 145), HILTNER and LANG (*Prakt. Blät. f. Pflanzenbau*, 1909, Parts 10 and 11), POPP (*Mitt. der Deutschen Landw. Ges.*, 1909, p. 724), etc. Thus for instance Hiltner and Lang determined that the effect of equal quantities of potash given to oats under the form

(1) Vergleichende Untersuchungen über die Düngerwirkung von 40 % igem Kalisalz & silicat, etc. — *Mitt. der Deutschen Landw. Ges.*, 1910, No. 45.

per cent. potash salts and of phonolite stood in the ratio of 100:22 (according to the other fertilizers applied at the same time); when to potatoes the ratio was 100:8 to 30 (according to the other fertilizers used at the same time).

Popp found that in an average of three years the effect of Stassfurt stood to those of phonolite as 100:26 to 31, and in another experiment lasting four years as 100:26 to 28.

It was thus demonstrated that in the open field, as in pots, the utilization of potash when given as phonolite was considerably less than when given as Stassfurt salts.

TACKE's field experiments showed that potatoes on sandy soil utilized 1.2 per cent. of the potash of 40 per cent. potash salts, and only 1.2 per cent. of that of phonolite (ratio 100:4.5); he showed further that with moor or moor soil the ratio of utilization was as 100:22 and that with loam or moor soil it was as 100:24.

In some isolated cases (observed by Popp) the effect of the potash in phonolite was found to be equal, and even superior, to that of the potash in Stassfurt salts. But these results, as well as their opposite in which phonolite either exerted no action at all or was positively injurious, have no significance; they are in the most favourable cases quite exceptional and most probably due to chance caused by the imperfection of field experiments.

The conclusion drawn from both pot and field experiments, namely that phonolite has a certain action but that this is inferior to that of Stassfurt, agrees with its petrographic mineralogical composition. One of the chief constituents of phonolite, and at the same time the richest in potash, is sanidine, which is decomposed with difficulty: the potash of this mineral is not leached by hot concentrated hydrochloric acid. Nosean and nepheline are more easily decomposed, but they are poor in potash and rich in soda. It is more easily decomposed, and weathered than sanidine; thus the potash available for plants would appear to derive from leucite and nepheline, while the chief potash-bearing mineral, that is sanidine, is hardly considered as a source of potash for vegetation.

From this composition of phonolite it can be further concluded that the easy weathering attributed to it is due to the minerals nosean and nepheline, which, however, contain but small quantities of potash. The weathering of phonolite, upon which so much stress is laid, can only very limited extent cause a rapid action of potash.

VALUE OF FELDSPAR AS MANURE.

For a long time past feldspar has been considered as a possible manure. W. KNOP in his treatise of agricultural chemistry (1868) at page 188 that it was not unlikely that some day feldspar would be used as a fertilizer.

It was also believed that its potash was easily assimilable by plants; experiments carried out with this mineral have shown that the manurial

effect of the potash-containing feldspars is very slight (1), as the following experiments prove.

HEINRICH and HONCAMP (see foot-note) found that the fertilizing effect of equal quantities of potash given under the forms of 40 per cent. potash of phonolite and of feldspar were as in the following table, in which the quantities produced above those of the control plot are given:

	Straw	Ratio	Grain	kg
<i>1. Barley</i>				
40 per cent. potash salt	348.2	100	343.8	
Phonolite	136.2	39	124.8	
Feldspar	60.2	17	25.2	
<i>2. Field peas.</i>				
40 per cent. potash salt	204.7	100	94.3	
Phonolite	85.9	42	29.2	
Feldspar	27.1	13	10.3	

As for the utilization of potash, if that, of the 40 per cent. salt being equal to 100, then the utilization of phonolite by barley was = 14 and field peas = 20; while the utilization of feldspar by barley was = 4 and field peas = 7.

This inferior effect of feldspar (orthoclase) compared with the phonolite (leucitophyre) is in harmony with the lower solubility of potash of orthoclase in water containing carbonic acid and in ammonium chloride solution as compared with that of the leucitophyre potash; this has been determined by R. MÜLLER, K. GLINKA, H. STREMME (2) and others. A series of experiments made under PRIANISHNIKOV's direction

(1) Manuring experiments with feldspar have been conducted, among others, by C. v. FELITZEN: *Svenske Moorkulturs Föreningens Tidsskrift*, 1891 (quoted by 3 *Ztschrift d. Landw. Kammer f. Schlesien*, 1913).

I. F. NILSSON: *Landbruks Akademiens Handlinger och Tidsskrift*, for 1839 (quoted by BLANCK, loc. cit.).

J. SEBELIEN: *Tidsskrift for det Norske Landbrug* XIII, 1901, p. 69 (quoted by 1 loc. cit.).

D. PRIANISHNIKOV: *Landw. Versuchsstation*, Vol. 63, 1906, p. 151; Vol. 77, 1912.

R. HEINRICH and F. HONCAMP: *Mitteilungen der Deutschen Landw. Ges.*, 1901 Part 4

(2) H. STREMME: *Die Verwendung des Leucitophrys als Kalisilikat. — Kal. Ztschrift für Gewinnung der Kalisalze*, 1912, Part 7.

that all the minerals of the feldspar group possess only a very low ash effect, as may be seen from the following figures:

	Without potash	With orthoclase	With microcline	With sanidine	With KCl (normal culture)
.....	5.33	4.56	5.61	4.66	22.96
orth. at	1.50	2.40	1.95	1.88	14.95
.....	2.05	2.45	2.65	4.65	13.85

Thus the potash feldspars (orthoclase, sanidine, microcline are the spars richest in potash) can compete with the easily soluble Stassfurt; still less than the leucitophyres (phonolite).

USE OF FELDSPAR-LIKE MINERALS (LEUCITE, NEPHELINE) AS MANURES.

It is well known that leucite (silicate of potash and alumina) is readily easily weathered. Owing to the circumstance that leucitic rocks found in considerable quantities in Italy, the question of using leucite manurial purposes has been investigated for some years past in that country (1). MONACO (2) has used for this purpose the fairly decomposed rocks containing leucite, of Orchi on the volcano of Roccamonfina; he tested its solubility in various substances but did not obtain any favourable results.

The manurial experiments directed by PRIANISHNIKOV (3) with leucite confirmed the above results and shown the not very satisfactory effect of leucite as a source of potash, as may be seen from the following figures:

(1) It may here be mentioned that in Italy leucitic basalt has been worked for leucite by separating the non-magnetic minerals, leucite and potash-mica (feldspar) from the magnetic silicates of iron and the basaltic magma, by means of magnets. The non-magnetic product contains an average of 30 per cent of leucite. The cost of preparation is about 17 shillings per ton (cf. LANDECK, Leucit ein Rohstoff für Kali- und Aluminiumdarstellung: *(Zeitschrift für prakt. Geologie)*, p. 80, quoted by Stremme, loc. cit.). Recently in Italy this method of obtaining leucite is raising interest.

(2) E. MONACO: Sull'impiego delle rocce leucitiche nella concimazione. *Le stazioni sperimentali italiane*, Part 7, pp. 577-583 (Modena, 1903). Cf. Stremme, loc. cit.

(3) PRIANISHNIKOV: *Landw. Versuchsstation*., Vols. 63 and 77.

Crop	Without potash	With leucite	With KCl
Millet I.	3.12	3.25	29.24
Oats	4.78	4.81	12.15
Wheat	2.75	4.05	6.40
Millet II.	4.5	8.27	48.68

According to Prianishnikov, nepheline gave better results than leucite. As on the shores of the White Sea there are great masses of this mineral, which, provided there were cheap means of transport, could perhaps be used in agriculture, Prianishnikov, at M. Fedorov's recommendation, can experiments to be made with this mineral. The following results were obtained:

Crop	Without potash	With nepheline	With KCl
Buckwheat	1.70	17.60	17.60
Millet	3.70	23.50	34.95

According to these experiments and others made by Prianishnikov's pupils, some of which, however, have to be accepted with some reserve, it appears that nepheline is capable of yielding good results as a sort of potash. Further experiments on the action of leucite and of nepheline are desirable to clear up the question finally.

According to Prianishnikov's data the chief mass of the nepheline mineral consists of nepheline, biotite and apatite; further experiments Prianishnikov may show that the good effects of nepheline mineral are due principally to its content of nepheline (elaeolite) but to the biotite it contains.

VALUE OF MICAS AS MANURES.

Both potash mica (muscovite) and magnesia mica (biotite) have a relatively high potash content.

The researches of PRIANISHNIKOV (1), BIELER-CHATELAN (2), J. SAMOJLOFF (3), E. BLANCK (4) tend to show, contrary to the generally received notion, that the potash contained in mica is more available to plants than that contained in feldspar.

According to Prianishnikov's experiments the effects of potash mica compared with those of potash feldspar were the following:

Potash fertilizer	Crop of barley	Potash fertilizer	Crop of oats
rol without potash	1.66	Control without potash	1.65
simple dressing	3.93	Orthoclase	—
double "	6.37	"	—
four-fold "	10.27	" four-fold dressing	2.25
"	—	" six-fold "	3.50
eight-fold	15.10	" eight-fold "	3.62
rol of potash, simple dressing	22.17	Chloride of potash, simple dressing	15.10

Blanck observed that magnesia mica or biotite, the potash content of which ranges from 3 to 11 per cent., is superior as a potash manure to potash mica or muscovite, which contains 8 to 10 per cent. of potash.

The above are the chief rocks and minerals which might eventually be used as potassic fertilizers. The researches mentioned in the preceding section prove that, as far as present observations reach, their manurial effect is considerably inferior to that of the so-called Stassfurt salts and that at present at least they cannot be discussed as substitutes for the latter. At present some of them may eventually acquire local importance.

The nepheline examined by Prianishnikov seems perhaps to be more effective than the other silicates of potash, but its potash content is only 3 per cent. Prianishnikov arranges the various minerals according to their merit as potash manures as follows: nepheline, mica-schist, biotite, leucite and muscovite, elaeolite, leucite, apophyllite, sanidine, orthoclase, xoclase.

(1) PRIANISHNIKOV: *loc. cit.*

(2) BIELER-CHATELAN: *Compt. Rend.*, 1910, Vol. 150, p. 1152 (quoted by Blanck, *loc. cit.*).

(3) J. SAMOJLOFF: *Zentralbl. f. Mineral etc.*, 1910, p. 261 (quoted by Blanck, *loc. cit.*).

(4) E. BLANCK: *Journal für Landwirtschaft*, 1912, p. 97.

Though the above order is not perhaps based on thoroughly reliable experiments, yet in the main it is correct and shows that the feldspars richest in potash are the worst sources of potash, for, as is well known, the decomposition of feldspar diminishes inversely with its potash content.

In the above considerations I have not taken into account the conditions of price, as a general comparison can not be made.

COMPARISON OF THE PRICES OF POTASH IN PHONOLITE AND IN STASSFURT SALTS.

Such a comparison can only be made with some degree of precision in the case of phonolite, as this mineral is already on the market as a potash manure.

The prices of one pound of potash in the forms of kainite, 40 per cent. Stassfurt salts and phonolite are as follows:

Part of Germany	Kainite	40 % salt	Phonolite
	— pence	— pence	— pence
West: Cologne, 1910 (1)	0.889	0.940	0.801
Centre: Bernburg, 1911 (2)	0.534	0.828	1.394
■ Giessen " "	0.700	0.876	1.031
North: Oldenburg, 1912 (3)	0.892	0.935	1.260
East: Danzig, 1913 (4)	—	0.908	2.403

Thus it is only in the immediate vicinity of the place of production that phonolite can compete with the Stassfurt salts. But even there, if the manurial effect of the mineral be considered, its use does not seem to be profitable.

EXPERIMENTS WITH THE OBJECT OF IMPROVING THE ACTION OF THE MINERALS.

Attempts have been made to improve the effect of the ground mineral by simply mixing it with certain other fertilizers. Ferd. Schack of Cologne has taken out a patent for the following process:

(1) According to REMY: *Ill. landw. Ztg.*, 1910, No. 677.

(2) " " KRÜGER: *Mitt. der Versuchsstation Bernburg*, No. 48, 1911.

(3) " " POPP: *Oldenburg Landwirtschaftsblatt*, 1912.

(4) " " GERLACH: *Landw. Centralblatt für die Provinz Posen*, 1913, No. 3.¹ perhaps no wholesale price was taken as the basis of the price of phonolite.

cess for the preparation of manures composed of recent eruptive is containing potash and combinations of lime. The quantity of such, or in combination as cyanamide, nitrate of lime, carbonate of gypsum, to be mixed with the finely ground, unroasted mineral in at quantity to provide the molecular equivalent of the bases contained mineral.

means of the exchange of bases the potash contained in the eruptive is calculated to form combinations assimilable by plants.

EIFER, BLANCK and FLÜGEL (1) have examined the above process of careful experiments, and have ascertained that the effect of the phonolite is in no wise improved by it.

Experiments of Prianishnikov have shown that the not easily potash of feldspar is not rendered more assimilable by mixing with logically acid fertilizers such as sulphate of ammonia, which on the y increase the solubility of the hardly soluble phosphoric acid of phosphates. This agrees with the fact that neither phonolite nor has a better effect on acid moor soils than on other land.

CHEMICAL TREATMENT OF SILICATES OF POTASH.

several countries many attempts have been made to render the contained in several minerals, and especially feldspar, more soluble utrial processes. With this object in view several patents have been out in America for processes which consist essentially in roasting the potash mineral with lime, or its carbonate or chloride, or common This process is, however, too expensive and it is now sought to potash as a by-product in the manufacture of cement. The question er fully reported in this *Bulletin* (2).

milarly in Sweden, as well as in Germany, the treatment of feldspar has ed. Sulphuric acid and electricity have been applied but hitherto any decisive result (3).

onclusion we may subscribe to the opinion of the Swedish agriculturist F. VON FEILITZEN, who says : "Even if the above attempts repre- increase of our knowledge on the hardly accessible source of in feldspar as a means of emancipating our agriculture from foreign fertilizers, we are still a long way from the solution of this important until we reach it we can be satisfied that in the German potash possess an excellent, quick-acting and not too expensive manure".

¹ *c. d.*

² No. 1613, B. Dec. 1912.

³ America great hopes were founded on the treatment of seaweed, from which in reality tities of potash can be extracted. Nevertheless a factory recently erected in California industry has already given up treating seaweed as unprofitable.

The Present State of Olive Growing in Italy

by

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From the most remote antiquity the cultivation of the olive has been very important in Italy.

The special conformation of the country, its position in the basin of the Mediterranean, that is in the centre of the habitat of the olive, the mildness of its climate and the fertility of its soil, render the peninsula favourable to the growth and production of this oil plant. It is certain whether Italy or Spain occupies the first place for extent of olive-growing and for quantity of oil produced. Whilst the somewhat more recent Spanish statistics are liable to discussion, in Italy at present a different system is followed in the valuation of the area under olives, a distinction being made between the area devoted exclusively to olive trees and that which these trees share with other crops. Thus comparison between the two countries is not possible at least as regards the areas.

The statistics made before the introduction of the new system give the following figures for the acreage under olives :

	acres
Average between 1870 and 1874	2 210 650
" " 1879 " 1883	2 294 630
" " 1890 " 1895	2 663 538
" " 1901 " 1908	2 705 428

With the new system the figures are:

	acres
Average between 1909 and 1912	—
Olive trees intermingled with other crops	4 358 5
Olive trees alone	2 353 5

Considering the figures according to the new system to be correct, it appears that the area estimated at 2 705 428 acres was in reality 34 acres.

Though we may not infer that the area occupied by the olive has increased from 2 210 650 acres in 1870 to the present 3 423 420 acres, as the figure may be, and probably is, due to greater accuracy or at any rate to a different method of estimating the area, there are in reality grounds for believing that the area under olive trees has sensibly gained in extent, as a fair number of new plantations are to be seen, mostly better selected than the older ones. There was, however, a short period after 1880 during

which many olive groves were destroyed to make way for vineyards; this took place especially in Sicily and Calabria.

As for the yield, statistics point to a constant decrease from 1870 to the present time.

Taking into consideration large averages we get, up to 1908, that is to the new statistics, the following figures for olive oil:

	gallons
Period between 1870 and 1883	73 843 000
" " 1885 " 1896	53 663 500
" " 1897 " 1908	45 988 800

According to recent statistics the average from 1909 to 1912 was 282 000 gals.; but perhaps 50 025 800 gals. would be nearer the mark, as would include the residual oil (including "olio lavato", extracted from the pomace by washing; "olio d'inferno", collected from the well under the presses; and that obtained by treatment with carbon disulphide). (1). In comparison, with the returns of the older statistics the figure of 43 956 000 gals. should be taken, as it includes only the "inferno" oil. It confirms the decreased yield of the olive tree.

The causes of the decrease of production and of the critical state of the crop during the last thirty years are many and of various kinds, namely: weather conditions, parasites, and constitutional and cultural conditions.

Reviewing notes on the oil crop since 1889, it appears that during these 30 years *drought* and *scirocco* caused more or less injury in 21 cases; *winter* frosts and *cold springs*, and *mists* and *rain* that injured the flowering, in 7 cases; the *olive fly* caused serious and general injury in 10 cases; lesser or partial damage, together with *Rhynchosciara* and *Phlaeothrips* and other insects in 17 cases; *Cycloconium* caused partial injury from the year 1902 onwards and since 1910 with increasing gravity and in almost all the growing districts. From the above it is seen that the most efficient cause of injury is the almost constant *drought*, which is easy to understand if one remembers that the olive tree grows mostly on hills and mountain slopes and most frequently without the necessary work being done to retain the rainwater, while the

(1) Whilst in the old statistics the quantity of oil was ascertained directly from that sown during the season in each commune, with the new system the quantity of olives recorded and the quantity of oil is calculated according to the average yield in the mill in the various districts. This yield does not include the "inferno" oil, nor that obtained by washing or treating with carbon disulphide, though these oils also are put upon the market; the first of these oils is used to a great extent as food by the poor, who often prefer it to the better oils; it is also used, as well as that obtained by washing and by treatment with disulphide, in the industries. The "inferno" oil may be calculated at about 1 per cent. and the other two oils at 2.5 per cent. of the crushed olives.

olive tree requires a good deal of moisture, which, as Giglioli (1) says, is the manure *par excellence* of the olive tree, especially during the growth of its fruit. Next in order of importance come the serious attacks of the *olive fly* and other animal or plant parasites, the development and spread of which are to a great extent dependent upon the abnormal physiological and cultural condition of the trees which we shall briefly consider.

In the first place let us examine how the olive is cultivated in the various regions of Italy (2) (see Table I).

TABLE I.

Region	Interspersed culture acres	Specialized Culture acres	Total acres
Piedmont	—	—	—
Liguria	62 738	88 426	151 164
Lombardy	9 139	3 705	12 844
Venetia	2 717	4 693	7 410
Emilia	16 549	—	16 549
Tuscany	685 919	26 182	712 101
Marches	425 581	—	425 581
Umbria	141 778	17 043	158 821
Latium	126 711	40 508	167 219
Abruzzi and Molise	657 514	4 940	662 454
Campania	446 082	106 210	552 292
Apulia	545 376	712 101	1 257 177
Basilicata	42 484	40 014	82 498
Calabria	491 530	141 284	632 814
Sicily	696 787	117 078	813 865
Sardinia	7 657	51 376	59 033
Total	4 358 562	1 353 560	5 712 122

(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: *Di alcune condizioni che influiscono l'efficacia dei concimi chimici*. Rome, 1903.

(2) MINISTERO DI AGRICOLTURA, INDUSTRIA E COMMERCIO. — UFFICIO STATISTICO AGRARIO. *Prospecti riassuntivi dei XX prodotti rilevati nel quadriennio 1909-1912*. 12, June 1913.

the above table shows the olive tree is grown in all the regions of Italy, in Piedmont, but two thirds of the olive groves are in the south peninsula, the provinces of Apulia, Sicily and Calabria occupying in respect the foremost positions.

Three-quarters of the olive groves are under intermingled crops, they contain besides olive trees other plants, most frequently cereals (wheat and maize) which are grown up to the very trunks of the trees; the groves consist of old irregularly arranged trees, often in rows straight down hill on very steep soils, or without sufficient protection from the surface water which lays their roots bare. In those groves (the older ones) formed exclusively of olive trees, they are often too together so that the crowns in their struggle for light and air grow to great height; as much as 33 to 48 feet; this may be seen in Calabria, Sicily and in some parts of Tuscany.

The number of different varieties scattered at random in the groves is considerable; there is also much confusion in their names; nevertheless the number of the prevailing varieties grown for oil in each region is relatively small. The following may be noted as being the most frequently met with and richest in oil:

In Liguria: *Taggiasco*.

In Tuscany: *Razzo* or *Frantoiano*, *Moraiolo* or *Morinello*, and *Leccino*.

In Umbria and the Marches: *Raoi* or *Razzo*, *Moraiolo*, and *Carbonella*.

In Latium: *Carbognola* or *Marsella*, and *Verniera*.

In the Abruzzi: *Nordana*, *Gentile* and *Olivone*.

In Apulia: *Paesana* or *Baresana*, *Coratina*, *Monopolese*, and *Ogliarola*.

In Calabria: *Ottobratica*, *Coccitanica*, *Mammolese*, *Nicastrese*, *Cumiana*, and *Roggianese*.

In Terra di Lavoro and Molise: *Aurina* and *Caiazzana*.

In Lombardy and Venetia: *Casaliva* or *Nostrana*, and *Drop* or *Tombolet*,

In Sicily: *Ogliaia*, *Calamignara*, and *Cerasola*.

In Sardinia: *Maiorchina* and *Genovese*.

In general, among the above-mentioned varieties that give the most oil, there are others called *Olivastri*, *Olivastroni* or *Olivastrelli*, as they are harder, more resistant and more constant in bearing fruit than the preceding varieties, but their fruit does not contain so much oil as it is delicate. These latter varieties deserve greater consideration in view of the exhaustion and low productiveness of the other varieties due to having been multiplied a vegetatively during centuries and to their resistance to unfavourable conditions.

In fact for centuries the olive trees have been multiplied by means of the *puppole*, as the egg-shaped buds which are formed at the base of the stem are called in Tuscany, Umbria, Latium and Reggio Calabria, in other regions this method of multiplication is used. In the Marches, in Abruzzi, Catanzauro, Cosenza and Sicily cuttings (*talee*) are used, in Liguria, Lombardy, Venetia, Latium and some parts of Sicily the shoots that grow at the foot of the tree (*polloni*) are preferred. Less frequent is the use of wild olive trees, as in the districts of Lecce, Capitanata

Grosseto and Sardinia, and still more rarely recourse is had to plants obtained by sowing the olive stones. The result of the above vegetative method has been to perpetuate the defects of the mother plants, such as canker, and resistance to frosts, drought and parasites. To the harm caused by original defects, the injury caused by neglect or unsuitable pruning, manuring, tillage of the soil and control of parasites is frequently added.

As for pruning, while the necessity of practising it at short intervals possibly every year or at least every two is being gradually recognized, the custom of pruning every three or four years is still very prevalent; there are some important oil-producing districts, especially in the south, where as many as seven or eight and even ten years elapse between pruning and the next (1).

In Italy there are some centres in which capable pruners are found; they are much esteemed and sought for abroad (Dalmatia, Istria, Crete). There are also schools which prepare pruners by means of practical courses. A wider diffusion of the sound principles of olive pruning would be desirable, because in several regions nothing could be more capricious, sceptical and ignorant than the way in which this, the most delicate of cultural operations and intimately connected not only with the productivity of the tree but with its vegetation and resistance to disease, is carried out. Some think that they must cut blindly, topping and even pollarding the tree; others treat the olive like the mulberry; others, again, scarcely touch the tree, notwithstanding the length of time that is allowed between successive prunings, for fear of removing too much foliage (parts of Calabria, of Sicily, of Tuscany, of Liguria). Some lop off a main branch every year leaving the rest untouched, with the idea of thus rejuvenating the tree (1) while in reality they favour the spread of canker (Umbria). Other pruners train the main branches nearly horizontally, hollow out the crown and cause the tree to produce a number of low hanging branches reaching almost to the ground (Bari, Potenza and Florence districts, part of Umbria, etc.), while others keep the whole framework of the tree almost vertical, remove all the lower branches or allow the tree to grow naturally, in each case considering the special conditions of the tree nor the requirements of the variety, etc.

As for manures there are districts where little or no manuring is practised, some in which manures are given once every three or four years, others in which the olive tree is frequently and well manured. General farmyard manures (from horse stables and cattle and sheep sheds) are given; sometimes pure sheep or goat dung or night soil is used. The animals are often run in the olive groves for the sake of their droppings; less frequently woollen rags, leather waste, hoof and hair shavings, fish residues, silkworm chrysalides, olive pomace and the like.

(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: *L'olivo e l'olio in Italia*, Monograph no. 24 at the International Exhibition in Paris, 1900.

ITEM: *Inchiesta eseguita sulla propagazione e concimazione dell'olivo*, 1912.

plied as manure. Mineral substances, such as builders' waste, ashes a limited extent chemical manures, or vegetable matter, either pre-rotted or not, such as seaweeds, swamp grasses, leaves of forest trees, pine needles, etc., are given. Lastly leguminous green manures (beans, vetches, etc.) (1) are used, but only to a very limited extent. The olive trees grown together with other crops get the best treatment as they profit by the manure given to the latter.

For tillage, in general little is done: the ground is hoed or ploughed a primitive implement at long intervals, generally once a year, or at the utmost, and this while drought is one of the weather factors that has the most depressing effects upon the yield.

For the diseases that attack olive trees there are a number of them: bacterial tumours, root-rot, olive fly, weevils, scale insects, *Psylla Rhynchites*, *Phlaeothrips*, fumago, *Cycloconium*. *Sicca Panizzi*, are a few diseases which have always with more or less virulence attacked the tree already apparently suffering from semiility. There is no doubt that present the most injurious pests are *Phlaeothrips* and *Cycloconium* latter especially, both of them destroying the foliage of great numbers of olive groves. *Cycloconium* is all the more dangerous inasmuch as though the ignorance of the great mass of olive growers its action is really insidious. The farmer notices an unusual fall of the leaf, usually in autumn, and gets alarmed. But soon, new leaves appear, the olive tree again green and the farmer is reassured, especially when he sees a small amount of bloom showing, which is the case if the disease is not far advanced. But meanwhile the flowers and the young fruit fall, the oil is lost, and by the end of the succeeding winter or in spring the leaves fall and more plentifully. The olive grower gets discouraged and abandons the olive trees to themselves, depriving them even of the scanty care that is bestowed upon them. This happens now in a great part of Italy and it is urgent to have recourse to the more or less perfect remedies that are known; that is to spraying with salts of copper in order to prevent the multiplication of the conidia of the fungus, and to the intensive culture of the olive tree as indirect means of increasing its vigour and resistance to disease.

Fortunately for Italy, by the side of the old unproductive and perishable groves there are others either recently planted or restored to health which are carefully tended, pruned, manured and systematically treated against diseases; these show clearly that no fear need be entertained concerning the extinction of olive cultivation, but on the contrary demonstrate its utility, especially on hill slopes where no other culture would be possible or advantageous. And if the results of experiments recently carried out in various parts of Italy on the improvement, management

See pamphlets already quoted: CONSOZIAZIONE DEI COMIZI AGRARI ITALIANI, *Sulla Natura chimica e con sostanza delle olio e degli ulivi. Risultati d'inchiesta in Italia.* — *di Cugliotti, relatore. Terni, 1912.*

and manuring of olive groves become widely known and lead to the following measures being adopted, there is no doubt the olive in Italy soon resume its place among the most paying crops.

The most important measures for the improvement of the olive groves are: thinning out of those that are too crowded, thus freely admitting sun, a great enemy of most parasites; gradually and systematically pruning the trees so as to oblige those that have grown too tall to throw out branches nearer to the ground; replacing the old decaying trees by ones that have been grafted to the varieties most suitable to the various localities and which can now be easily prepared in every farm or can be bought from the best nurserymen of Tuscany (Pescia, Pistoia, Florence) and parts of the country; a suitable arrangement of the steep slopes and the hoe or the plough together with green manuring so as to keep the necessary moisture in the soil during the summer; returning to the soil the necessary fertilizers, particularly those containing phosphoric acid and potash (and lime in some cases), and lastly spraying with mixtures containing copper against *Cyclamen*, which operation is rendered easier by thinning out and lowering of the crowns of the trees, and using even other treatments to control other pests.

The Recent Development of Cattle Breeding in Sweden

by

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I. -- INCREASE IN THE NUMBERS OF LIVE STOCK.

The northern position of Sweden makes it naturally more suitable for the rearing of live stock, particularly cattle, than for grain growing; this is all the more pronounced in the north, and Norrland produces a very small proportion of the grain required by its inhabitants.

The live stock of the country consists of horses, cattle, sheep, pigs, poultry and reindeer, the latter belonging to the nomad Lapps in the high north. The numbers at the end of 1911 were as follows:

Horses under three years	493 322	
Horses over three years	95 165	<hr/>
		588 487
 Cattle		
Steers	144 277	
Bulls	52 467	
Cows	1 837 035	
Young stock	655 830	<hr/>
		2 689 609
 Sheep	945 709	
Goats	66 136	
Pigs	951 164	
Poultry	3 981 141	
Reindeers	276 084	

If the various classes of stock (horses, cattle, sheep, goats and pigs) are calculated as cattle units (1), we get the figures shown in Table I as indicating the increase in the numbers of live stock in Sweden in the last half century.

TABLE I.

Year	Cattle Units	Per 1000 inhabitants	Per 1000 acres of area	
			total	of arable and permanent grass
1865	2 591 037	630	26	245
1875	2 863 006	653	28	247
1885	3 093 955	661	30	252
1895	3 367 999	685	33	272
1905	3 406 961	643	33	263
1911	3 617 472	655	35	291

Thus the live stock population has steadily increased; but since 1895 the increase of the human population has been more rapid than it. The fact that the number of cattle units per area of land has steadily increased through this period would lead one to expect a similar increase in the area under green crops, and the agricultural statistics show that this is the case. This increase has been especially in root crops for feeding, but the yield of grain on the temporary grassland has also increased considerably.

Sugar beet growing hardly existed 25 years ago; by 1890 the yield was 2700 tons and in 1911 it had risen to 950 300 tons. The crop of roots for feeding (mangels, carrots, turnips and swedes) increased from 3 235 000 bushels in 1865 to 98 351 000 bu. in 1911. In 1890 the crop of hay from temporary leys was 2 $\frac{1}{4}$ million tons, but lately it has exceeded 4 $\frac{1}{4}$ million. Green crops have also extended considerably, especially in the north, but there are no statistics for them. Further, the increase in grain crops is meant more straw available for feeding.

By means of this increase of fodder resources it has been possible to bring up the stock of animals; the development has been greatest with cattle and pigs, both in quantity and quality. The numbers of the horned stock of different types are shown in Table II.

(1) One cattle unit = 2/3 horse, 1 beast, 8 sheep, 12 goats or 4 pigs, two young animals of any class are equal to one adult of the same class.

TABLE II.

Year	Steers	Bulls	Cows	Young stock	Total
1865	282 844	38 791	1 185 556	417 163	1 924 354
1870	269 762	38 674	1 231 477	426 014	1 965 937
1880	289 071	47 985	1 409 236	481 465	2 227 757
1890	253 735	49 066	1 578 927	517 763	2 399 491
1900	218 932	51 390	1 764 819	547 414	2 582 555
1905	184 328	49 444	1 763 857	532 299	2 549 928
1910	152 925	54 703	1 861 219	678 679	2 747 506
1911	144 277	52 467	1 837 035	655 830	2 689 069

Only the steers have shown a permanent falling off in numbers; they are kept in Sweden only for work, this is due to the increase in wages of labour, which has made horses more economical owing to the quicker going. The fact that the number of bulls has not increased as rapid as that of cows, or has even decreased in some years, is probably the result of the extension of cooperative bull societies, which has meant considerable economy in the number required. Except for a slight relapse in 1910 caused by shortage of crops, the cows and young stock have shown a fair and steady rise in numbers, reaching over 55 per cent. in the period.

For a just appreciation of the enhanced value of the horned stock more attention must, however, be given to the improvement in quality which has greatly exceeded the numerical increase.

II. — IMPROVEMENT OF THE BREEDS.

When towards 1840, general interest began to be aroused in Sweden in the improvement of the cattle, the prevalent opinion was that the indigenous breeds were so inferior that the only way to improve them was by crossing with well-known breeds from other countries. A number of herds of various breeds were imported to find which would be the best for the purpose. The only two breeds which gained the confidence of farmers were the East Friesian (from Holland and Ostfriesland), and the Ayrshire; these breeds have become so widespread and have been so largely used for crossing that the indigenous breeds have almost entirely disappeared in the southern and central parts of the country, the introduced breeds have taken their place either pure or as cross-breds. A reaction against this excessive importation began towards the

century. The two introduced breeds had developed so well that it seemed necessary to depend on continued importation, which was uncertain for the breeder; little by little importation has become less tant, and rational selection of the breeding stock has led to such a pment of national breeding that Swedish East Friesians and Ayr- can compete with the animals in their original homes; recently of both breeds has been exported at very good prices.

esides this, some more or less wholly indigenous races have been ded. In Central Sweden there were a number of gentlemen's herds ded from the native red or yellow cattle, but containing a good deal ch, Shorthorn and Ayrshire blood; they combined a good milk yield considerable weight and early maturity. The owners of these herds ded to form a uniform breed without using imported animals, and efforts have been so successful that the race thus evolved, the Red Spottedish, has now been recognized as a pure breed. They are most like ires, but make better butcher's beasts than these.

While the above-mentioned breeds have done well in the more fertile of central and southern Sweden, the same cannot be said of the north country, where feeding is much more scanty and the beasts have to their food in the forest in summer. In these parts, the indigenous cattle, white or spotted on a white ground, was retained; this breed, as the Fjäll, gave little in the way of milk or meat, but was accus- to unfavourable natural conditions. It was generally believed that w production was a direct result of the conditions of life, and that g better was to be expected. All the same, a beginning was made thirty years ago at attempts to improve the breed by better feeding section of the best milking strains. The result of these efforts is that are now a number of small herds which give an average yield of 6000 ad more of milk a year, a very satisfactory amount in consideration of live weight; this, though increased a good deal, hardly exceeds is, for cows.

The uncertainty as to choice of breeds has now ended, and each district ded on one or more of the four breeds mentioned: 1) East Friesian, in the fertile districts; 2) and 3) Ayrshire and Red Spotted Swedish, where conditions are not quite so favourable; and 4) Fjäll, where the poor and forest pastures have to be used.

esides the Fjäll there was another polled breed, red in colour, of which few remnants remained scattered in out-of-the-way districts in various of the country. In the last few years these have to some extent been ed together to make a pure breed, the Swedish Red Polled cattle, and ults already obtained with some herds look encouraging.

III. — MILK YIELD.

he progress realized in the productivity of the cattle can also be rom the figures for production of milk and butter and for increase of eight. The official statistics do not give direct information on these

points, but our statisticians have attempted to estimate the figure milk production. Thus M. Gustav Sundbörг works out the average yield per annum as follows:

About 1870	2 600 lbs. per cow
» 1880	3 100 " "
» 1890	3 700 " "
» 1903	4 200 " "

Another auth^r, M. Nils Hansson, an authority on the dairy of the country, has estimated the present milk yield at an average lbs. The three first figures of M. Sundbörг's table are very uncertain as they come from a pure estimation of the production of the different provinces, in which the breeds, feeding and management are very variable. The figure for 1903 is already an improvement, as it is the result of estimation of the mean annual production made in every parish throughout the country. The 1912 figure is still more trustworthy, as it is based on the latest figures from the Dairy Control Societies.

Under these societies, numbering 749 in 1911-12, no less than 1,000,000 cows, or nearly 11 per cent. of the total number in the country, were submitted to careful control; the results are as follows.

The mean annual yield per cow was 5748 lbs. of milk, with an average fat content of 3.50 per cent., corresponding to 201 lbs. of butter-fat and 373 lbs. of butter. As the control herds are among those in which systematic efforts for improvement are made, M. Hansson has deducted 20 per cent. from this yield to get the average for the whole country, giving the figure quoted above.

The great variation of yield in different parts of the country can be seen by parallel figures from the two provinces giving respectively the highest and lowest yield (Table III).

TABLE III.

Province	Average yield		Number of cows under	
	milk lbs.	butter lbs.	total	per cent of total
Malmöhus: average	8 087	289.6	46 084	31
highest society	10 392	364.8	324	—
lowest society	6 200	239.3	64	—
Västerbotten: average	4 388	154.3	2 569	—

On the basis of these figures, the total milk production has been calculated as follows:

1875	about 3100	million lbs
1885	4100	" "
1895	5400	" "
1905	6600	" "
1910	13200	" "

The progress in milk production led to a corresponding development of the dairy industry. Formerly the treatment of milk was a household affair, but it was not till 1865 that the first dairies were started. The earliest were established by the owners of large estates to use the milk from their herds; these may be called "*estate dairies*"; but gradually *commercial dairies* came to be started by private persons or companies. They are not connected with any form of farming and treated purchased milk. The great profits which the proprietors of these dairies often made and the difficulties which arose from the lack of interest of the farmers in the quality of the milk sold to the dairy, combined to produce general discontent in this type of dairy; towards 1890 *cooperative dairies* were started; in these the farmers shared according to the amount of milk supplied and the content was soon also taken into consideration.

This type of organisation has proved very advantageous, both as regards better quality of the milk and the products turned out, and in giving better financial results. The consequence is that the cooperative dairies have gained on the estate and commercial ones, as shown by the figures in Table IV.

TABLE IV.

	1890	1900	1905	1910
Total number of dairies . . .	1 562	1 793	1 575	1 461
Estate	809	624	399	
Commercial	610	529	536	
Cooperative	73	302	470	
Milk treated lbs.	1 115 784 000	1 856 909 000	2 024 050 000	2 533 590 000
Milk produced "	35 480 000	58 657 000	62 791 000	73 985 000

The diminution in the number of dairies in the last few years is due to concentration of the industry, consisting in the disappearance of many small competing establishments in favour of larger and better organized ones.

The chief object of the Swedish dairy industry has always been the production of butter; a part of this, increasing up to 1896 has been exported particularly to England, to which country it goes direct or via Denmark.

The total exports for the last fifty years have been in round numbers

1861-65	355 800 lbs.	1886-90	31 074 000 lbs.
1866-70	248 900	1891-95	44 147 000
1871-75	6 954 700	1896-1900	48 074 000
1876-80	9 248 000	1901-05	42 718 000
1881-85	17 678 000	1906-10	40 857 000
1912		1912	45 717 000 lbs.

VI. — BUTCHER'S BEASTS

Before the beginning of the dairy industry and the exportation of butter, attempts had been made to export live cattle to England. The success of this enterprise was not great, owing to the poor quality of the Swedish cattle; but as the increasing interest in milk production gradually led to better feeding and consequent greater body development, the exportation of butcher's beasts became more important, till it was put an end to in 1892 by the prohibition of introduction of live cattle into the British Isles. Efforts to turn the exportation to Germany were also soon frustrated by similar measures in that country, but since the beginning of the new century exportation of live cattle and meat has developed again; it is directed chief to Germany and Switzerland.

TABLE V.
Annual exportation of cattle and meat from Sweden.

Year	Bulls	Steers	Cows	Young stock	Value
1881-85	1 207		30 660		317 400
1886-90	2 489	13 135	15 265	1 981	368 600
1891-95	3 935	5 481	9 300	955	203 650
1896-1900	2 292	1 253	5 265	1 010	103 550
1901-05	3 577	404	7 038	3 558	118 900
1906-10	3 365	563	8 284	4 971	190 950
1911	6 974	6 946	19 711	13 340	566 200

The importation of live cattle and meat into the northern industrial districts, chiefly from Finland, has never been of much importance. In 1911 the value was £. 34 600.

Naturally the better feeding has increased the live weight of the cattle. Statistics do not give any direct evidence on this point, but it can readily be demonstrated from material taken from the reports of the breeding societies. Thus, the normal weight of Ayrshire cows, which are the most spread in the central and southern provinces, was estimated at 1000 to 1100 lbs. about 1890; at present it averages 1100 lbs. The weight of Friesians, which are kept chiefly in the fertile province of Malmöhus, has also increased, and is now reckoned at 1300 lbs. The Red Spotted Swedish, developed chiefly by crossing with Ayrshires, occupies an intermediate position between these two breeds as regards live weight of the cows. The progress can also be observed in the two native polled breeds — the H (white and spotted), predominating in the north, and the Swedish H Poll, which is the most southerly branch of the hornless cattle. For Fjäll breed, the normal weight of the cows was estimated at 660 to 680 lbs. in 1890, and it now reaches 770 to 810 lbs.; the live weight of the H Polls may reach even 840 or 880 lbs.

V. — ORGANIZATION.

The development in the stock of cattle to which we have drawn attention is naturally the result of the efforts and care of the breeders themselves, but it has been greatly encouraged and facilitated by various measures taken by the authorities carried out at the public expense. In the first place should be mentioned the regular shows, with prizes distributed on a uniform system ("Flach System"); these were begun in the province of Skaraborg in 1882, and in 1892 were organized in all the provinces with the help of grants from the Government and the Agricultural Societies; each province forms a prize district. The idea of these shows is to bring to the attention all animals fit to be used for breeding and to classify them by prizes according to their value for the purpose. For each approved cow, the owner gives a service ticket for each year, giving the right to put the cow to a service bull of the same breed; the owner of the bull is then paid for the tickets at a rate depending on the class in which the bull was placed.

These shows are specially intended to improve the stock of small farmers, and they alone are entitled to prizes and service tickets for cows. But, in addition to the sums brought in by the service tickets to the owners of especially good bulls, the Flach system also encourages high-class breeding among the wealthiest farmers.

These shows, which are generally held every other year in a locality, have been very valuable in bringing farmers to recognize the importance of breeding from good stock. Another result has been that in each district one or two breeds have been fixed upon as specially appropriate for the cultural and economic conditions of that district.

The shows have continued to increase in number, and at the same time the proportion of the cows approved has become higher. In 1910, 626 animals were examined, and 55917, or 89 per cent., were approved or given prizes. The expenses for the year reached about £18 000.

As we have just shown, the giving of prizes and the money brought in by service tickets may make the keeping of bulls a profitable business to this circumstance is due the formation of cooperative bull-keeping societies. The provincial agricultural societies encourage these societies by loan without interest for the purchase of bulls and by special prizes at the shows. The formation of these societies has developed at about the same rate as the shows, and there are at present about 1200 of them, distributed throughout all the provinces of the country.

Another measure in connection with the shows has been the establishment of herdbooks for the more important breeds. These have generally been drawn up and published by the provincial agricultural societies soon after the starting of shows on the system described. Registers for certain breeds have also been established by the societies for the improvement of these breeds (Ayrshire and Red Spotted Swedish). Lastly, the Government has undertaken the preparation of herdbooks for one or two breeds; of these, the Ayrshire is the only one yet published, but the Fjäll will appear shortly.

Next to the shows, the Control Societies have contributed most largely to the great progress in live-stock breeding and the improvement of the economic position of stock farmers. The first society of this nature was founded in 1898, and at the end of 1912 the total number was 749, distributed throughout all the 24 provinces of the kingdom. The largest number, 160, is in the province of Scania, which is the most populous and best cultivated part of the country; but these centres of advancement in the economy of live-stock are right up to the desolate regions of Lapland.

The effects of the regular control organized by these societies have everywhere been seen in the disappearance of the cows that gave the small return for the food consumed and in a more severe selection of the animals to breed from; the consequence is that the average milk yield has shown a more or less rapid rise. In the earlier years this rise was largely due to better feeding; the amount of food per cow, as well as in relation to the milk yield, often rose for a time; but the farmers soon learnt to make up more suitable rations, and the number of fodder units diminished in proportion to the milk produced, and often also absolutely.

By publishing the results obtained yearly for each herd, the control societies very soon made known the productive capacity of the herds as well as of the individuals composing them. From the beginning of the present century, the control figures for the production of milk and butter have been used along with the external points and pedigrees for judging the animals at the great national shows held every five years (last in 1911). But these control figures are not deemed sufficient for judging the breeding value, especially in highly selected strains.

meet the need for more searching examination of the animals for this, which is particularly required in the distribution of the great State or breeding stock, competitions of breeding centres have been established. The herds entered for these competitions are submitted to careful examination for two years; the observations extend to quantity of milk and butter produced and consumption of food for each cow, and uniformity, and vigour for the herd in general. Such competitions have been held twice, in 1903 and 1908, and a third will begin this year. The honour of being classed as a breeding centre has been found to be of such considerable commercial advantage that at present money prizes are not distributed except for herds of the Fjäll breed, which as a rule belong to farmers.

The direction of the official measures just described is entrusted to committees appointed by the Government and the Provincial Agricultural Societies; but besides these, the breeders have formed societies for the different breeds. The first of these was the Red Spotted Swedish Society, formed in 1899; in 1899 the Swedish Ayrshire Society was founded for the development and consolidation of the various strains of Ayrshires occurring here over a large area, and of very varying types. These two societies organized the registering of animals descended from those entered in the Ayrshire Cattle Herd Book and given a certain annual yield of fat. For the Red Spotteds, cows must give 220 lbs. of fat, and bulls 200 lbs. out of dams giving 265 lbs. The minimum for Ayrshire cows is 200 lbs. during each of two successive years.

To facilitate the purchase of good breeding stock, each of these societies holds two auction sales a year; at these, registered bulls, free from tuberculosis, and approved at an inspection immediately preceding the sale, are offered to the public.

During the present year, two new societies have been founded to work on the same lines as those already mentioned, one for the Friesian breed and the other for the Swedish Red Polls.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

1126 — **National School of Waters and Forests at Nancy (France).** — *Comptes rendus de l'Académie des sciences de l'Institut National Agronomique*, in *La Vie agricole et rurale*, Year II, No. 35, pp. 224-230. Paris, August 2, 1901.

A State School of Forestry was founded in France in 1824, and years later was established at Nancy where its headquarters have remained ever since. These consist both of educational buildings and of residential quarters for the State scholars and for the staff; special mention is being made of the museums, where extensive forestry collections of all kinds have been accumulated. There are further 7625 acres of forest under the direct management of the School; the greater part of this is in the neighbourhood of Nancy (Forests of Haye and of Amance) and the rest in the Vosges Mountains about 40 miles distant (Forests of Bleurville and of Ban d'Etival). These four forests provide examples of various types of forest management, and together with a nursery on the outskirts of the Haye Forest, where there is also a piscicultural experimental station and an arboretum at Amance, complete the equipment of the School.

The students may be divided into two classes: the so-called "regular" students or State scholars and the "free" students. The former are those who have already taken their diploma at the State Agricultural School ("Institut National Agronomique") and have further been submitted to a competitive entrance examination in mathematics and modern languages. Occasionally a graduate of the Polytechnic School ("Ecole des mines") is admitted directly and without competition. The total number of these State scholars varies from 12 to 35 according to the needs of the Forest Service, and at present they number 18. When entering the School they sign a contract for four years, the first and last of which are spent doing military service, while the two intermediate years are spent at Nancy. During the latter period, the scholastic year is divided into two terms: the winter term from October to April, when the work of

of lectures and laboratory work, and the summer term April to it, when the work is wholly of a practical nature and takes place in school forests. Further, during the two years, two months are spent in forests in other parts of France, and throughout the whole course an amount of military instruction is given and a fairly strict discipline maintained. After leaving Nancy the State students complete their military service by serving for a year as sub-lieutenants in an infantry regiment and then pass into the State Forest Service.

The second class of students consists chiefly of foreigners, who are admitted to the School and allowed to follow the course of instruction wholly or in part. The latter embraces forestry and its applied sciences, forestry and forest law.

The teaching staff consists of seven members of the Forest Service, military instructor, and a lecturer in Letters and modern languages, the management of the School forests is in the hands of two special officers who were originally appointed to take charge of the experimental work.

Travelling Schools for Rural Domestic Economy (France). — DUCLOUX, A., *La Vie agricole et rurale*, Vol. 2, No. 38, pp. 305-308. Paris, August 23, 1913. Though the first travelling school for Rural Domestic Economy in France was founded in December 1905, at the present day 30 such schools or others are to be opened shortly, and the formation of yet 6 others is under discussion. Many of them give short summer courses in training of their districts. On the whole it may be said that the instruction is appreciated by farmers and their families, and that the movement is a success.

The Agricultural Institutions of Spain. — DR LA ROSA, GUMERSINDO FERNANDEZ. Apuntes históricos sobre los progresos de la agricultura española en los cincuenta años últimos. — *Boletín de agricultura técnica y económica*, Year V, Nos. 49-54, p. 63-74, 167-176, 236-244, 335-345, 449-460, 521-532. Madrid, January-June, 1913. This article gives a historical summary (accompanied by general results on rural and political economy) of the more important facts concerning the progress of agriculture in Spain, especially in the south-west district, during the course of the last fifty years. The writer brings into prominence the measures taken by the Government for the encouragement of agriculture and agricultural instruction.

A Royal Decree of 1855 founded the "Escuela general de Agricultura", of the first agricultural engineers who studied there founded, in 1862, "Sociedad El Fomento Agrícola" at Jerez de la Frontera; to this society the introduction into Spain of the first mowing and threshing machines, innovations, and the introduction of *Hedysarum coronarium* L. ("sulphur"), which necessitated horse-rakes and hay-makers, into the southern district of the Peninsula, gave a great impetus to agriculture and to breeding industries in that district.

From 1875 to 1879, the extension of the "Instituto Agrícola de Alfonso" was provided for by a series of legislative enactments. This Institute

was the former "Escuela general de Agricultura". The law of August 1876, dealing with agricultural instruction, created chairs of agriculture in all the colleges ("Institutos") of the Kingdom. The "Asociación de agricultores de España" dates from about the same time, and by the merit of having organised shows, competitions and congresses. The "Exposición Nacional Vinícola" of 1877 was on a magnificent scale. Unfortunately, phylloxera made its appearance shortly afterwards in Spain and destroyed over 7 million acres of vineyards. The spread of the pest was arrested by reconstituting the vineyards with vines on American stocks.

The Royal Decree of February 14, 1879, created the "Cuerpo de Ingenieros agronomos", and the "Junta consultiva inspectora". In 1883 a stallion dépôt was added to the "Instituto Agrícola de Alfonso XII", which was later attached to the "Estación pecuaria de la Granja central"; this latter is still in existence.

The Royal Decree of December 9, 1887, gave its sanction to the organisation of the Corps of Agricultural Engineers; another decree dated December 13, 1887, provided for the creation of different Experimental Farm Schools ("Granjas-Escuelas experimentales de Agricultura"). The "Granja experimental" of Saragossa contributed in a great measure to the improvement of beet cultivation; this crop has in some parts (in the neighbourhood of Malaga and Motril) replaced sugar cane. The first beet sugar factory was established in 1882 at Cordova; others were subsequently opened at Grenada, Antequera, Aranjuez and Vico.

The oldest of the model farms which still exists is (after the "Granja central", annexed to the Agricultural school of Moncloa) that of Saragossa, which was established by Royal Decree of September 23, 1881. The same decree also created the model farms of Grenada, Seville and Valladolid; these were, however, suppressed after some years. A Royal Ordinance of June 2, 1882, instituted the "Granja levantina," which is situated in the "Jardín Real" near Valencia; on January 16, 1889, the "Granja-Escuela experimental" of Jerez de la Frontera was created, followed during the same year by the model farm of Corunna, and the next year by that of Barcelona. Those of Valladolid, Valencia, Jaén, Badajoz and Ciudad Real have also been in existence for some ten years; the model farms of Navarre and Santa Cruz (Tenerife) are in course of development; those of Melilla (created in 1910), Salamanca (created 1911), Cordova, and the Balearic Isles (created in 1912) are beginning operations.

To the "Escuela Especial de Ingenieros agronomos" and the "Granja central" are annexed stations for the following branches: agriculture, plant diseases, seed selection, vine growing, stock breeding and machine testing. For a long time, vine-growing stations have existed at Haro, Villafranca, Pandas, Toro, and Reus (the latter is now transformed into the school of Vine Growing and Wine Making); while those of Calatayud, Coceñal, Jumilla, Requena, Valdepeñas, Aranda de Duero, Felanitx (Balearic Islands) and Orense are of more recent date. Funds have been granted for the establishment of 14 "Estaciones de Agricultura generale" at Arevalo, Alba de León, Llerca, Segovia, Zamora, Asturias, Burgos, Castellón, Motril, Málaga,

res, Fonsagrada and Alcalá de Henares. There is a Sericulture Station at Murcia, and others are about to be established at Aranjuez and Puerto de la Mar (Cádiz). Dairy Industry Stations exist at San Felices de Béjar (Santander) and at Nava (Oviedo); and there are Stations for Irrigation Crops at Biñéfar (Huesca), as well as at Seville ("Granja provincial de 1900 XII"), a Rice Culture Station at Huesca (Valencia), and experimental oliveyards at Tortosa (Tarragona), Hellín (Albacete) and Lucena (Jaén).

The law of July 17, 1895, regulates surveying operations. In accordance with Royal Decrees of August 14 and of October 20, 1895, a trial beginning was made in the Province of Granada. The law of August 24, 1896, provides for the establishment of the survey of crops. In 1899, surveys were made in the Provinces of Cádiz, Córdoba, Málaga and Seville. The present general survey was regulated by the law of March 23, 1906.

Since 1900 the Government has given a great impetus to irrigation works. Royal Ordinance of 1903 commanded the publication of the work entitled "El regadío en España" (Irrigation in Spain) compiled by the Council of Agriculture from the reports forwarded from the provinces by agricultural engineers. The Royal Decree of May 11, 1900, reorganized the Hydrological Service; seven divisions were created for hydraulics, and important works for canals and reservoirs were begun; some of these are in course of execution. At the present time, Spain possesses nearly 4 million acres of irrigated land (counting the areas which are irrigated when water is abundant).

It has long been known that the cotton plant flourishes in some parts of Spain; nevertheless, the Spaniards have almost entirely ceased cultivating this crop. With a view to encouraging the cotton-growing industry, a law of July 19, 1904, granted £16,000 in prizes (to be awarded over three years), and also exempted the cotton crop from taxation. The Council of Agriculture was charged with drawing up the regulations for the execution of this law, but their precautionary and restrictive measures (published in the Royal Decree on January 28, 1906) made the latter a dead letter.

In conclusion, the writer gives some suggestions as to the part which should be played by the Government and the administration in the encouragement of agriculture, and the best measures to be adopted in order to secure its progress.

- The Financial Measures of the Prussian Chamber of Agriculture. — *Issues in Volkswirtschaftliche Blätter*, Year XI, No. 10-11, pp. 135-138. Berlin, June 10, 1913. In order to guarantee for the future the financial resources of the German Chambers of Agriculture, the law of June 30, 1894, dealing with the Chambers, accords to them the right of levying a certain tax upon the cultural properties of their district which are over a certain size.

§ 10 of the above mentioned law runs as follows:

"The total tax levied must, in general, not exceed one-half per cent. of the net return of the land tax; only in extraordinary cases, and with the authorisation of the Minister, may this figure be exceeded". This paragraph

TABLE I.—Taxes levied by the Chambers of Agriculture.

ventions that the Chambers of Agriculture must publish an annual sheet, and submit the latter to the Minister, while at the same time have complete autonomy in the management of their bank, and their keeping operations.

Table I, which is based upon the "Statistische Nachweisungen aus dem Bericht der Landwirtschaftlichen Verwaltung von Preussen", shows how in recent years the Chambers of Agriculture have used the power granted to them.

This table reveals a tendency to the progressive increase of the tax; in 1903 there were still seven out of the thirteen Chambers of Agriculture which had not reached the legal limit of a levy of $\frac{1}{2}$ per cent. on the return of the land-tax, and only one which had already over-stepped the limit, in 1910 none of them had remained within the limit, and nine of them had already, with the authorization of the Minister, passed it. The sum of the taxes collected by the Chambers of Agriculture was about £100 000 in 1903, and amounted in 1910 to about £120 000.

Table II shows the total expenses of the different budgets of the Chambers of Agriculture since 1903.

After a comparatively slight increase in the expenditure from 1903 to 1904, since the latter date there has been a regular increase of about £50 000 in the annual expenses of all the Chambers of Agriculture, since they rose from £420 000 in 1904 to about £700 000 in 1910. This increase is noticeable in all the clauses of the budget, but especially in the one dealing with the encouragement of forestry, which has risen from £3100 to £11200, three or four times the original sum.

The chief increase in expenditure is furnished by the sections providing for the encouragement of scientific work and instruction, and for the promotion of stock breeding. These two sections alone represent the chief of the Chambers and account for over half their expenditure.

The progressive increase of the receipts corresponds, in some measure, to the increase of the expenses. The receipts proper to the Chambers are by far the largest and they have increased much more rapidly than the Government grants. Thus, since 1903 the receipts proper of the Chambers of Agriculture have increased from £230 000 to £460 000, while during the same period the Government grants have increased from £120 000 to £100 000.

As appears on comparison with Table I, the increase in the expenses of the Chambers does not so much depend upon the increase of land-taxes (i. e. their more strict enforcement) as upon the larger receipts of other sections of the Chambers (duties, school fees, sale of publications, etc.).

The figures given show very clearly the extraordinary development of the Chambers of Agriculture of the Prussian Chambers of Agriculture.

TABLE II. — Budget

Financial Year	EXPENDITURE					P. eso do re sive in
	I For scientific objects and instruction	II For veterinary attendance	III For the encouragement of stock breeding	IV For the encouragement of fish breeding	V For the encouragement of forestry	
I	2	3	4	5	6	
	2	2	2	2	2	
1903 . . .	116 857	24 938	95 503	2 778	3 113	
1904 . . .	120 317	21 480	98 805	2 392	4 420	
1905 . . .	132 363	34 224	105 497	2 497	5 476	
1906 . . .	138 152	36 799	111 459	2 951	6 247	
1907 . . .	161 839	37 675	131 190	3 388	6 616	
1908 . . .	172 974	40 018	135 891	3 572	7 252	
1909 . . .	213 505	40 478	147 625	5 030	8 238	
1910 . . .	255 305	43 774	155 391	5 773	11 150	
	632 1/2		915	1 1/2		

In 1910 the "Verein für Landwirtschaft und Gewerbe" in Hohenzollern

N. B. — The great increase in the figures in column 2 « Scientific objects and instruction » is due to the fact that the cost of periodicals and other publications of the Chambers was no longer included in the cost of instruction.

1130 — Resolution of the Swedish Authorities on the Subject of the Future Organization of the Swedish Station for the Improvement of Seeds. — *Swedish Association's Tidskrift*, pp. 142-223, 1913.

The Svalöf Station for the improvement of field crops, founded in 1890 by private initiative, has hitherto belonged to the Swedish Association for the Improvement of Seed, notwithstanding the fact that the increasing subventions granted by the State have rendered it more and more dependent upon the Government. (1)

Owing to the always greater extension of its work and to the

(1) See Dr. HJALMAR NILSSON's original article: « The Swedish Institute for the Improvement of Field Crops at Svalöf », *B.* June 1913, pp. 834-843.

of Agriculture.

1 e st at re 1	VIII Administration of the Chambers	RECEIPTS				
		Total expenses	Total receipts	Government grants	Other grants from Provinces, etc.	Receipts proper
		9	10	11	12	13
6	77 771	403 465	399 823	123 628	39 796	236 399
1	75 779	414 255	417 829	131 775	38 844	247 210
8	92 350	459 871	455 373	138 647	39 631	277 095
10	97 115	508 519	508 343	146 476	43 195	318 672
14	126 227	585 242	572 040	162 068	49 561	360 412
16	112 144	625 276	616 015	182 355	55 284	378 377
18	112 692	655 456	659 633	179 678	56 530	423 425
34	90 049	703 775	697 804	187 492	56 427	453 885

for the first time. It furnished the following figures:

86	163	1 952	1 899	1 471	15	413
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large decrease in the administrative expenses (column 9) in 1910 are due to the fact that the administrative expenses, but to the fund for the promotion of scientific objects and

give the employees of the establishment a surer and more advantageous position, a request for the increase of the subvention was made (the increase is so considerable that out of the total required revenue, estimated £7 414, the subvention alone figures for £4 950), and the question was raised whether the State should not take over the establishment as one of the institutions.

This change was supported by the Royal Direction of Agriculture (Landbruksstyrelsen), which proposed however that the establishment should be managed by a special board nominated by the King and consisting of seven members.

In order to ensure intimate cooperation with the Central Institute of the State possesses at Stockholm, in which other branches of agriculture

tural experimentation are carried out, it was proposed that two of the members should be on the board of both of these institutions.

According to the measures proposed by the Government and approved by Parliament, the establishment will continue to belong to the Swedish Association for the Improvement of Seeds, in order that it may preserve that liberty of form which seems to have been so favourable to its development. The managing committee will consist of seven members, of whom five will be nominated by the Government and two by the Association for the Improvement of Seeds; a close cooperation with the State Central Institute will be obtained by means of two members belonging to the boards and by the discussions of the scientists of the two institutions. A laboratory will be installed for the chemical experiments required by the establishment. The State subvention is fixed at £4,950 for the year 1911. It is estimated that the Association that receives the improved seeds and disposes of them commercially will give £2 200, while other sources of revenue will yield £264.

In case the sum that the commercial association will have to pay according to the agreement approved by the Government should exceed the sum estimated in the budget, the excess will be put aside as an asset for the budget of the following year, thus allowing the contribution of the State to be diminished.

1131. - Agricultural Shows.

Belgium.

1912. Nov. 8-10. Brussels. — Poultry show organized by the Brabançonne Club. Address: M. Pitard, Nivelles, or M. W. Collier, 97 Rue des Cailloux, Jette.

Nov. 8-10. Bergerhout (Antwerp). — National poultry show organized by the "Neck Society of Bergerhout. Address to the secretary: M. Eug. Dierkx, Chausée de Thour, 221, Bergerhout, Antwerp.

Nov. 15-17. Renaix (East Flanders). — International poultry show organized by the Pigeon Club. Address to the president: M. Otto Rose, Renaix.

Nov. 15-17. Charleroi. — International rabbit show organized by the "Cunicole Club of the Charleroi valley. Address to: M. Pévenasse (secretary of the club), Charleroi.

Nov. 29-30. Ghent. — Annual international poultry show organized by the "Neck Poultry Society. Address to the secretary: M. A. Heyndrickx, 3 Rue du Saint-Esprit, Ghent.

Dec. 14-15. Mont-sur-Marchienne. — National poultry show organized by the "Oiseau et cunicole". Address to: M. Léopold Germain, Place du Wez, Mont-sur-Marchienne.

Dec. 20-22. Antwerp. — Eleventh international poultry show, organized by the "Oiseau et cunicole anversais". Address to: 28, Rue Torfs, Antwerp.

1914. Feb. 7-9. Iseghem (West Flanders). — Fourth international poultry show organized by the "Hoenderbond 't Neerhof". Address to: M. Valère Laridon, Café Royal, Iseghem, France.

1918. Nov. 12-16. Paris, Grand Palais. — International poultry show organized by the "Société Nationale d'Aviculture de France". This show will include fowls, ducks, geese, keys, rabbits, pigeons and dead poultry; there are a great many prizes in the object of art offered by the President of the French Republic, money prizes by the Ministry of Agriculture and the General Council of the Seine, gold and medals, etc.

u. 17-19. Lille. — Fifteenth international poultry show organized by the "Les Aviculteurs du Nord" Society. Address to the general secretary: M. Emile Desreumaux, 92 Rue Franklin, Roubaix, Nord.

Arch. Nice. — General agricultural and horticultural show organized by the "Société Centrale d'Agriculture et d'Horticulture". Address to the secretary: 113, Promenade des Anglais, Nice.

Fay. November. Lyons. — Permanent horticultural show, comprising: fruit-bearing and ornamental plants; instruments, machines and apparatus for use in the various branches of horticulture; plans, designs, books and publications on the subject. There will be three temporary shows of horticultural produce, as follows: June 5-9, Sept. 4-9; Nov. 21-27. Horticulturists and amateurs wishing to exhibit should make application in writing to the Mayor (M. le Maire de Lyon, Secrétariat de l'Exposition, Hôtel de Ville, Lyon), twenty days before the opening of each of the shows, indicating the number and nature of the exhibits and the space required.

Germany.

Oct. 22-23. Königsberg. — Sixty-first show and sale of live stock, organized by the "Ostpreussische Holländer Herdbuch-Gesellschaft". The catalogue of the animals shown may be obtained from the offices of the society: Beethovenstrasse 24-26, Königsberg i. Pr.

Nov. 22-23. Karlsruhe (Baden). — Rabbit show organized by the "Badenia" Rabbit Society.

Nov. 5-7. Berlin. — Thirty-eighth Berlin Fat Stock Show.

German East Africa.

Tessalam. — General exhibition for German East Africa, organized by the Permanent Exhibition Committee for German Industries ("Standige Ausstellungs-Kommission für die deutsche Industrie"). Address: Berlin, N. W. 40, Roonstrasse 1.

United States of America.

Cattle shows and fairs:

Oct. 28-Nov. 7. Jackson, Mississippi.

Nov. 3-8. Phoenix, Arizona.

Nov. 5-12. Shreveport, Louisiana.

Nov. 22-29. Fort Worth, Texas.

Horse shows and fairs:

Nov. 15-22. New York.

Nov. 24-29. Fort Worth, Texas.

Dec. 1-6. Chicago.

Agricultural Congresses.

United States of America.

Oct. 22-Nov. 1. Tulsa (Oklahoma). — Eighth International Dry-Farming Congress.

Applications for the report (costing one dollar) should be addressed to: Sir John Burns, Executive Secretary-Treasurer, International Dry-Farming Congress, Tulsa, Oklahoma.

CROPS AND CULTIVATION.

1133 - *On the Circulation of Sulphur and of Chlorine on the Earth, up to the Importance of this Process in the Evolution of Soils and in the Livable World.* — Kossovskii, P. (Bureau for Agricultural Science of the Soc. Committee of the Central Administration for the Organization of the Land of Agriculture), in *Russischer Journal für Experimentelle Landwirtschaft*, Vol. XIV, p. 181. German Edition, p. 218. St. Petersburg, 1913.

The writer treats specially the following subjects :

- I. The chlorine and sulphur contents of rocks and soils
- II. The quantities of chlorine and sulphur which are brought to the surface of the earth and to the soil by atmospheric precipitations.
- III. The quantities of chlorine and sulphur that are washed out of the soil by subsoil waters.
- IV. Part played by the chlorine and sulphur conveyed by the atmosphere in the evolution of the soil.
- V. Chlorine and sulphur content and requirements of plants.
- VI. General considerations on the circulation of chlorine and sulphur in nature.

CHAPTER I. — The chlorine and sulphur contents of rocks and soils

On the basis of analytical data, mostly taken from the existing literature on the subject, the writer comes to the following conclusions :

- 1) *Crystalline eruptive rocks* rarely contain more than 0.1 per cent chlorine ; the most widely spread rocks generally contain still less, in only traces. The amount of sulphur in the same rocks is higher than that of chlorine and often exceeds 0.1 per cent.
- 2) *In clastic and sedimentary rocks* chlorine in slightly soluble form is completely lacking ; it is present only in the form of easily soluble salts generally in traces.
- 3) *In soils*, chlorine in slightly soluble forms is not present ; the amounts that have been observed are due to easily soluble salts. Sulphur is present in the soil in certain quantities in slightly soluble form, but they are small ; according to available data, the total amount of sulphur in the soil is found in the humous layer, and is 0.04 per cent. corresponding to 0.1 per cent. of SO_3 ; in soils rich in humus, such as the Chernozem, it reaches 0.1 per cent. The sulphur contents of the soil decrease considerably with the depth.

CHAPTER II. — Chlorine and sulphur in atmospheric precipitation

On the strength of material collected in eight localities of European Russia and of the data available for other countries, which are taken from N. H. J. Miller's treatise "The amounts of nitrogen as am-

s nitric acid, and of chlorine in the rain-water collected at Roth-d" (*The Journal of Agricultural Science*, Vol. 1, Part 3), the writer is himself justified in drawing the following conclusions.

For Chlorine.

1) The chlorine content of the several atmospheric precipitations varies in the different parts of the world and within very wide limits: from 0.4 to 58.11 per million. In the analyses made for Russia the lowest chlorine content in one determination was 0.42 per million (Shatilov Experiment Station), the highest 58.11 (Borovoje Forest Experiment Station).
2) The yearly averages of the chlorine content of atmospheric precipitations varies in the different parts of the world within much narrower limits: from 1.46 per million (Konstantinov Meteorological Observatory in the neighbourhood of St. Petersburg) to 9.72 (Island of Ceylon), when Guardia is not considered, in which locality the exceptionally high figure of 31.20 is recorded. For the localities in Russia which have been examined the differences are still smaller, the lowest chlorine content (Konstantinov Observatory) being 1.46 and the highest (Borovoje) 4.00. In general it may be assumed that the atmospheric precipitation of the interior of a ranges in chlorine content between 2 and 3 per million.
3) The amount of chlorine contained in the atmospheric precipitation depends chiefly on the position of the locality with regard to the seas and seas; on approaching the latter the amount of chlorine increases. Also in which border on salt lands the precipitations may be richer in chlorine. Slight precipitations contain more chlorine than the heavier ones.
4) The quantities of chlorine which fall in one year with the atmospheric precipitations per unit of area vary also very considerably in the various localities of the world. According to available data the lowest quantity of chlorine was observed at the Konstantinov Observatory, namely 7.09 lbs. per acre, the highest at Guardia in Spain, 399.5 lbs. per acre. But the yearly average of chlorine in most territories varies between 8.92 and 22.30 lbs. per acre. Among the Russian localities examined the first place belongs to the Forest Institute (near St. Petersburg) where each acre received 14.98 lbs. of chlorine.

B. Sulphuric Acid.

1) The lowest content in sulphuric acid per million parts of atmospheric precipitation sank in the single determinations lower than the chlorine content, namely to 0.28 of SO_3 (Sapolje Experiment Station). The maximum was 0.52 of SO_3 at the Forest Experiment Station at Mariupol.
The yearly average of sulphuric acid in the precipitation in the Russian localities that were investigated was 1.93 (Shatilov Experiment Station) and the highest 14.17 (Mariupol Forest Experiment Station). At localities within the area of influence of large cities, factories, railroads, etc., the amount of sulphuric acid contained in the atmospheric precipitations has been determined by the writer to be above 10 parts per million, while in the country districts between 2 and 3.
2) The quantities of sulphuric acid per unit of area which fall to the ground with the precipitations vary considerably in the localities examined. Places

which are not under the influence of chimney smoke get yearly about 8_g of SO₃ per year. In the neighbourhood of towns and industrial works yearly amount reaches almost 72 lbs. In such localities the greatest portion of the sulphuric acid falls in winter. Thus, for instance, at Forest Institute one-third falls during the summer half-year and two-thirds during the winter half. Localities in the country do not show much difference in the quantities that fall during the various seasons.

CHAPTER III.—*The quantities of chlorine and sulphur contained in subsoil waters.*

On the basis of theoretical speculations the writer gives the following characters of subsoil water:

1) The percentage of chlorine and sulphur in the water in the soil subsoil is in general higher than that in atmospheric precipitations.

The general and fundamental cause of this greater percentage is evaporation, both directly from the soil and through vegetation, of a part of the water received as atmospheric precipitation.

2) As the ratio between the water that penetrates into the soil from the atmosphere and that which evaporates varies between wide limits so do the relative chlorine and sulphur contents of soil and subsoil water vary greatly. In special cases these contents increase owing to a series of concurring causes.

3) The percentage of chlorine and sulphur in the soil water of any locality may, under certain conditions and when the amounts of these elements contained in the atmospheric precipitations are known, furnish data by means of which the evaporation of water from the soil or the relative quantities of soil water that are formed, may be determined.

4) The chlorine and sulphur content of the water in the soil varies not only with the locality, but from year to year and from season to season and changes in the course of years.

CHAPTER IV — *Part played by the chlorine and sulphur, which are contained by atmospheric precipitations, in the evolution of the soil.*

The writer considers exhaustively the two following questions: first what length of time is necessary for the chlorine and sulphur of the atmosphere to transform a soil into a salt soil when there is no formation of subsoil water; secondly what is the least quantity of subsoil water necessary in order to carry away all the chlorine and sulphur introduced into the atmosphere. At the conclusion of the chapter the writer formulates the following propositions:

1) As primitive rocks contain only small quantities of chlorine and sulphur, and these in the processes of weathering and soil forming are easily transformed into soluble compounds and rapidly leached out, the salt

juence would be a relatively rapid impoverishment of the soil in two elements, until their complete disappearance took place. As the development of plants is impossible in the absence of sulphur, continuous introduction of sulphur from the atmosphere a necessary ion for vegetation and for the evolution of the soil.

) In soils and subsoils in which, in connection with a dry climate, under waters are not formed, an accumulation of sulphur and chlorine due to atmospheric precipitation must take place. If it be assumed as an approximation that the soil receives from the atmosphere only 4.46 lbs. of chlorine and 4.6 lbs. of SO_3 per annum (which corresponds to about one-half of the total amounts of these substances which are received per acre and per annum), the author calculates that it would take 12000 years to collect 0.5 in. of each of these substances in a layer 3 ft. 3 in. deep; in this time there would be a decidedly salt soil which would contain about 1 per cent. chlorine and sulphur compounds. But to render a soil too salty for most of the crops, which it becomes when it contains 0.05 per cent. of chlorine, 1000 years would be sufficient, and these from a geological point of view would be a brief period.

) If, on the contrary, there is formation of subsoil waters, it requires quantities of them to leach out completely the chlorine and sulphur compounds conveyed to the soil by atmospheric precipitations. Thus the quantities assumed above, namely 4.46 lbs. of chlorine and the same of sulphur, would require about 720 cub. ft. of water per acre to leach them out of a 1 per cent. solution, which would be equal to a layer of water of about 1 in.; consequently the formation of a relatively insignificant quantity of soil water is sufficient to prevent an accumulation of chlorine and sulphur compounds in the soil.

CHAPTER V. — Quantities of chlorine and sulphur contained in and required by plants.

The writer discusses these points principally in connection with the strength of the available Russian and North American soils. The following conclusions are arrived at:

) Determinations of sulphur content carried out with all due precautions on plants themselves, not on the ash, show that cultivated crops are very rich in this element: in some of them, such as cabbage, turnips, onions, the sulphur content is higher than the content in phosphorus. In other plants, for instance red clover, lucerne and sugar beets the two elements are present in equal quantities; cereals especially are poor in sulphur, containing about twice as much phosphorus as sulphur.

) According to the above data, the sulphur content, expressed as SO_3 referred to air dry matter, ranges in the grain of cereals from 0.29 to 0.45 per cent. in straw between 0.26 and 0.55 per cent. Clover hay contains 0.2 per cent. of SO_3 , lucerne hay 0.50 per cent. Peas contain 45 per cent. (*Phaseolus*) 0.58 and soy beans 0.85. In some crucifers the sulphur

content exceeds 1 per cent.: in turnips it is 1.85 and in cabbage 2.05 per cent. of SO_3 .

3) The quantities of sulphur which are removed by average crops on an acre may be expressed by the following figures: for cereals 0.25 to 1.25 lbs. of SO_3 (in crop of 1338 lbs. of grain and 1962 lbs. of straw per acre); for red clover 16.06 lbs. (4014 lbs. of hay); for lucerne 26.76 lbs. (53.5 lbs. of hay); sugar beets about 44.6 lbs and cabbage 65.13 lbs. (in a crop of 3212 lbs).

4) The sulphur derived from atmospheric precipitations is sufficient to satisfy the wants of relatively abundant crops of cereals only, but on condition that there be no leaching out of sulphur; for if there is any such loss the cultivation of such plants unless accompanied by appropriate manuring will gradually lead to a shortage of sulphur and the crops will diminish until an equilibrium gets established between the sulphur brought into the atmosphere and that taken up by the plants and leached out by soil water.

5) On the other hand, in localities situated near towns and industrial centres, the wants of such plants as are most exacting in their sulphur requirements can be completely satisfied by the quantities furnished by the atmosphere. In making and judging experiments on the requirements of sulphur in the soil the above mentioned great differences in the amount of sulphur given up by the atmosphere according to locality must be taken into account. This especially in treating the question of soil sickness in connection with clover and in dressing clover with gypsum.

6) The reserves of sulphur in the soil cannot be considered as being in comparison with the requirements of plants as to this element. An average sulphur content of the soil (in the upper layer one foot deep 0.1 per cent. SO_3 , in the next 2 ft. 3 in. 0.025 per cent.) amounts to about 503 lbs per acre in a layer 3 ft. 3 in. deep; one half of this amount corresponds to 285 cereal crops or 70 lucerne crops.

All the preceding data and considerations show that in certain localities an impoverishment of the soil as to sulphur and a shortage of this element in the nutrition of plants is possible, and consequently that sometimes in the succession of heavy crops the introduction of sulphur by means of suitable manuring becomes necessary.

CHAPTER IV. — General considerations. On the circulation of chlorine and sulphur on the globe.

It is specially emphasized that at present the circulation of chlorine consists chiefly in a mechanical transport between the land, the sea, the atmosphere, and in the form of that simple combination in which chlorine is prevalently found.

The circulation of sulphur is considerably more complicated: on the one hand sulphur is subject to a continuous passing from an inorganic to an organic form and vice-versa, on the other it undergoes oxidation and reduction processes in most of which micro-organisms take part.

The Condition of Soil Phosphoric Acid Insoluble in Hydrochloric Acid.—
W. H. (Scientist in Soil Laboratory Investigations, Bureau of Soils, U. S. Department of Agriculture), in *The Journal of Industrial and Engineering Chemistry*, 15, No. 8, pp. 664-665. Easton, Pa., August 1913.

The official method for the analysis of soils is accomplished by digesting a known quantity (10 grams) of the soil in hydrochloric acid, specific gravity 1.115, for ten hours on a steam or water bath, and then analysing the solution thus obtained for the constituents which it is desired to determine.

This method does not invariably give the total amount of phosphoric acid present in the soil analysed. The writer gives the values obtained in a study of the chemical composition of Maryland soils; the average percentage of phosphoric acid extracted was about 57.6 per cent. In the same series of Virginia soils, in every case except one, gave less amounts of phosphoric acid than the total amount obtained by the fusion method.

There are two explanations for this:

- The phosphoric acid not extracted by the official method is present in the soil in compounds insoluble in the acid used.
- It is present in a soluble form which it is protected from the action of the acid.

We have no means of directly testing the first of these possibilities. Mineral phosphates have, however, been found which their finders consider insoluble in hydrochloric acid. None of these insoluble phosphates have been discovered in the soils examined by the Soil Bureau; if they do exist in them the quantity present must be extremely small. The amount of insoluble phosphoric acid present in minerals which carry the former as an essential ingredient, or which is present in forms derived from the interaction in the soil solution, must be very small indeed.

With regard to the second possible explanation, mineralogical analyses show that a very large number of soils contain apatite, a hydrochloric soluble calcium phosphate, enclosed in quartz grains. Such soils subjected to acid digestion, and the apatite was found still inclosed in the quartz, and apparently unattacked.

Conclusion, it may be said that possibly a very minute quantity of phosphoric acid is present in soils in compounds which are insoluble in hydrochloric acid, but a large part of the phosphoric acid not extracted is in a soluble form, *i. e.*, as apatite, which is protected from the action of the acid.

The Question of the Inoculation of New Crops on Moor Soil.—RAMM, E. in *Deutsche Landwirtschaftliche Zeitung*, Year 33, No. 66, p. 597, 1 fig. Berlin, August 16, 1913.

The inoculation of new crops on moor (1) soil, whether by means of inoculation of the soil or of pure cultures, is a matter of much difficulty when it is a question of

We translate the German "Hochmoor" as "moor", and "Niedermoar" as "low moor".
cf. TANSLEY: "Types of British Vegetation", pp. 208-213.

tion of thus treating hundreds of acres. For this reason, attempts for many years been made on the State farm in the Wiesmoor to substi-
a dressing of nitrate of soda (180 lbs. per acre) for inoculation. The
tempt has been most successful: the crops grew well right from the
and developed in a thoroughly satisfactory manner.

From this time, all new crops in the Wiesmoor have been thus prepa-
the results have been uniformly successful and no interruptions in the
cation operations have occurred. In 8 to 14 days after germination,
roots of the clovers and other Leguminous plants show plenty of nitro-
nodules.

On areas which have not been inoculated or manured with nit-
the root nodules do not make their appearance until much later, gene-
not until about eight weeks have elapsed. Further, the crop, as a
shows gaps which only fill up after some time.

It should be the task of science to ascertain the source of the bact-
which, on the application of nitrogenous manure, produce such a gen-
and regular crop of nodules on the roots, and to account for the inci-
bacterial receptivity possessed by plants with nitrogenous manuring.

The practical results of the experiments on the Wiesmoor show
where new crops must be sown throughout the spring and summer, a n-
genous manure is less troublesome and much more certain in its effects
inoculation; thus the application of easily soluble nitrogen is preferable
an economic stand-point. With a nitrogenous manure, the success of
newly-sown crops can be more surely reckoned upon, while there are
failures in the case of inoculation. The areas receiving the nitro-
manure develop so well that the cost of the fertilizer is paid by tur-
the sowing year to account. If the greater certainty is taken into
sideration, a nitrogenous manure is also cheaper than inoculation. Far
experiments should show how far the above-mentioned results are afe-
by the application of nitrate of soda in larger or smaller amounts than
180 lbs. per acre employed in this case.

1136 - **Experiments on Denitrification.** — TCHIRIKOV TH. and SCHOACK, A. in
stia Moskovskago Selskokhozaiistvennago Instituta, Year XIX, Part 2, pp. 270-284
Moscow, 1913.

Three series of experiments on denitrification conducted at the Ag-
mic Institute at Moscow.

I. *Influence of moisture on the course of denitrification in the green
straw in progressive doses.* — Experiments carried out in sandy loam soil
different degrees of moisture: 40, 60, 80 per cent. of the water capa-
of the soil. The results obtained were the following:

1. Oats both without straw and in doses of 0.25 to 1 per cent. of the
in pots, developed best with 80 per cent. of moisture.
2. A diminution in the yield of oats was observed with incre-
doses of straw and this with various degrees of moisture.
3. This diminution of yield took place more rapidly with 80 per cent.
moisture; with less moisture it was less intense.

4. In general an increase in the degree of moisture favours the depressing influence of the straw both on nitrate of soda and on sulphate of ammonia.
5. The decrease of yield caused by the application of 0.25 per cent. of straw is equivalent to that caused by a reduction of the degree of moisture to 10 per cent.

II. *Addition of carbonate of lime in the presence of straw.* — The addition of carbonate of lime diminishes the depressing effects of straw considerably but not completely. The favourable effects of carbonate of lime are already visible with a dose of 0.25 percent. of the earth; but on increasing the dose to 1 per cent. there was no further increase of yield.

III. *Action of sugar, starch and straw.* — Experiments of cultivation made with additions of sugar, starch and straw, in doses of $\frac{1}{4}$ to 1 per cent. in sand. The plants grown (oats and mustard) developed least with next came starch and straw. As for the balance of nitrogen the writers make the following principal observations :

- 1. The depressing action on plants caused by the addition of the above named substances is not due to a real denitrification.
- 2. The nitric nitrogen of the soil gets converted into albuminoid bodies, depriving the plants of a considerable part of the assimilable nitrogen.
- 3. The percentage of nitrogen in plants is the greater the more their development is depressed.
- 4. The addition of organic substances in the presence of nitrates causes reduction of an alkaline medium and in direct ratio to the quantities added.

• Irrigation Resources in California and their Utilization. — ADAMS, F. (under the direction of FORTNER, S.) — U. S. Department of Agriculture, Office of Experiment Stations, *Bulletin* 254, pp. 95, 9 maps. Washington, June 1913.

For many years the United States Geological Survey has been mapping topography, measuring streams, and studying underground waters in California, and engineers of the Reclamation Service have been looking for possible developments of unreclaimed land. In 1910 the Office of Experiment Stations directed an irrigation census of California, and in 1912 the Conservation Commission of California published three full reports dealing with Northern, Central, and Southern California respectively and the irrigable area of each section, together with discussions of water supplies, their use, and estimates of future possibilities. The present Bulletin summarizes these and records the results of a further series of field investigations made by the Office of Experiment Stations in cooperation with the Conservation Commission during the year 1912.

Irrigation is not equally necessary in all parts of California, neither can it be predicted from the annual rainfall. If grain were the only crop grown, but little irrigation would be required in the coastal or in the interior valleys of the northern half of the State. Below the Colorado the necessity would increase, becoming absolute in the lower San Joaquin Valley and most of the State south of Tehachapi. But even in the northern part of the State the rainfall occurs almost entirely during

the winter, which is the growing period, and during the rainless summer few plants can be grown without an artificial water supply, so that in this section during the latter season is a distinct advantage in nearly every section of the State.

Northern California, or that portion of the State north of San Francisco, is divided into six irrigation zones: the coastal zone, the mountain valleys to the north, the mountain valleys to the east, a zone of high plateaus and valleys in the north-eastern corner of the State, the Sierra foothills on the western slope of the Sierra range, and the Sacramento Valley. The present extent of irrigated land and possible future developments are estimated as follows.

	Agricultural land — acres	Irrigated at present — acres	Total to be irrigated — acres
Coastal counties	502 200	2 675	10
North-central mountain valleys	435 000	103 850	23
North-eastern plateaus and valleys	867 000	161 930	30
Feather River valleys (mountain valleys)	158 000	50 600	10
Sierra foothills	789 000	45 250	20
Sacramento valley	3 449 000	123 500	2 50
 Total	6 200 200	487 805	3 45
	100	7.9	

In a general way it may be said that the irrigated land in Northern California forms but a small percentage of the agricultural land and a very abundant water supply which is used in a wasteful fashion. Used to the best advantage and with suitable storage, etc., the water resources of this section should be sufficient to increase the irrigated area 7.9 to 55.6 per cent. of the agricultural land.

Central California, or that part of the State south of San Francisco, north of Tehachapi, is divided into four irrigation zones: the coastal, the large central valley of San Joaquin, the Sierra foothills on the western slope of the Sierra range and a high zone east of the Sierra range. The cultural areas irrigated at present or liable to future development follows:

	Agricultural land	Irrigated at present	Total area to be eventually irrigated
	acres	acres	acres
Central Valley	887 000	82 000	200 000
San Joaquin Valley	7 576 000	1 728 975	3 850 000
Sierra foothills	730 000	10 620	50 000
East of the Sierra	472 000	137 760	200 000
Total . . .	9 665 000	1 959 355	4 300 000
	100	20.3	44.5

In the coastal valley the water is not abundant and is further reduced by the fact that the cities take a heavy toll. Already one-third of the water used there for irrigation is pumped, and as valuable crops can be raised when water is available, considerable expense may be incurred in order to obtain it. On the whole, good use is made of the water supplies of central California, and future development will only take place by practising the strictest water economy and, in the case of the coastal valley, by tapping the underground resources. In the high zone east of the Sierra Nevada the available water supply will be tapped by the Los Angeles aqueduct, now under construction, which will divert 430 cubic feet per second for a distance of about Los Angeles.

Southern California, or that part of the State south of Santa Barbara and the Tehachapi Mountains, is divided into six irrigation zones, four of them are more or less coastal, the two others being the Colorado and Mojave deserts:

With regard to the coastal zones, Santa Barbara and Ventura Counties have not, up to the present, utilized their water resources as completely as the other parts of Southern California, and the surface flow together with underground supplies might serve to increase the irrigated area 6 $\frac{1}{2}$ times. Development in the Los Angeles and San Gabriel River zone will depend largely on the Los Angeles aqueduct, and in the two other coastal zones no developments are likely to take place, as the supplies are already well developed. In the desert zones, the luxuriance of plant growth under irrigation is inevitably bringing about development, though the water resources are limited. Increased supplies will come in part from the Colorado River and in part from underground supplies.

Summarising: "The total area of irrigable land found in the zones of abundant water supplies, which includes all of the valley lands, the rolling country of the Great Valley, the arable portions of the Sierra foothills up to 3000 feet in elevation, and all of the plateau and desert lands to which

	Agricultural land — acres	Irrigated at present — acres	Total area to be eventually irrigated — acres
Santa Barbara and Ventura Counties	509 250	49 656	3225
Los Angeles and San Gabriel River lands	441 986	167 454	3815
Santa Anna River lands	876 671	213 407	2790
San Diego County	363 668	19 880	8711
Colorado Desert and River Valleys	1 550 750	279 600	7663
Mojave Desert	2 328 000	15 489	1130
Total	6 070 325	745 486	19490
	100	12.3	32

some irrigation water supplies are available, is 21 935 500 acres, of which 3 192 646 acres are already irrigated, and 9 699 600 acres are estimated to be the area to be ultimately irrigated."

The writer states that the results given above are largely statistical so that the estimates of areas ultimately to be irrigated can only be approximative. The 1912 investigation dealt chiefly with a detailed study of six typical irrigated areas which are fully described in the Bulletin. The writer repeatedly urges the absolute necessity of a general State control of all water supplies, for in that manner only can they be put to the best and lead to a maximum development of agriculture in California.

1138 — The Murrumbidgee Irrigation Scheme in New South Wales. — *Journal of the Royal Society of Arts*, Vol. LXI, No. 3168, pp. 873-875. London, August 8.

The soil of the so-called "chocolate" lands in the western part of New South Wales is extremely fertile, but up to the present owing to insufficient rainfall, the land has only been used for grazing sheep and cattle. As the outcome of the work of a Royal Commission, appointed thirty years ago, the State Government has begun work on a gigantic irrigation scheme in the Murrumbidgee River basin.

The waters of the Murrumbidgee are derived from the lofty table lands in the Eastern part of the colony where the rainfall amounts to from 70 in. per annum; the chief gathering ground is a basin 5 000 sq. miles in extent with only one outlet to the lower country through a deep gully at a place called Burrinjuck. With a suitable dam here the most permanent reservoir is obtained, backing up the river for 41 miles and two

ant tributaries for 15 and 20 miles respectively, and forming a lake on an area of 29 square miles. "The dam is of Cyclopean concrete, 240 ft. at its maximum section, and 18ft. wide at the top. The up-stream is nearly vertical, being slightly battened down to the base. The down-stream face shows a curve concave to the down-stream to 60 ft. below the top, so as to make the dam 36 ft. thick at that point. Then there is a slope of $1 \frac{1}{2}$ to 1 for a depth of 90 ft., at which point the dam is 90 ft. thick and follows another curve in the same direction, for 50 ft. vertical, to a height of 140 ft. above the base. From this point the face is vertical, and finishes at 76 ft. from the inner toe of the foundation. In plan the dam will be 176 ft. in length along the crest, which is curved convex to up-stream to a height of 1200 ft. The wall is being built up in a series of units, each representing the average quantity of concrete that can be placed in one day. These units break joint in every direction, so as to imitate masonry construction and minimise defects due to remission of work."

The outlets consist of four 4 ft. 6 in. pipes, passing through the dam in the foundation, and controlled by valves, and two byewashes at the bottom, one at each side of the dam. The sides and bed of the gorge are of granite, and blocks of this are used for the concrete; sand is also obtained nearby. The granite floor is irregular, so that the concrete masses key into the holes, thus preventing any possible movement under the pressure of the water.

The estimated cost of the dam, notwithstanding the high price of the granite, comes to about £ 750 000, which is roughly equivalent to £ 1 per foot of water held back; this is believed to be much less than the cost of similar work elsewhere; the Assuan dam, which holds up a maximum of 75 ft. of water, as against 230 ft. at Burrinjuck, cost £2 7s. per foot of stored water.

For 220 miles below Burrinjuck irrigation is not required; then a dike at Berembed, near Narandera, forms a convenient point for the diversion of the river. The main irrigation channel is 132 miles long and has a 34-mile branch, as well as distributing channels, and will serve to irrigate a block of land of 1 300 000 acres. At the point of diversion, a flow of 1000 cubic feet of water per second will be available. The main irrigation canal is 64 ft. wide at the water-level with a flow 8 ft. deep, equal to a present discharge of 1000 cubic ft. per second; this capacity will eventually be doubled. Distributing canals carry the water to each separate farm. Most of the farms on the area are designed for mixed farming and comprise 50 acres of irrigable land. Some, however, are smaller, while cultural and workmen's blocks are narrowed down to 10 and 2 acres respectively.

The irrigation settlement will include three towns, about 400 miles from Sydney. These will be planned on modern lines, and will be provided with factories for the utilization of the produce. Roads will be graded in such a way that no landowner will be more than a mile and a half from one.

The soils in the Murrumbidgee Valley are suited for irrigation, being loamy, deep, rich and friable. The natural drainage is such as to preclude any necessity for an artificial system. Analyses show that the soils contain an exceptional proportion of potash, and nodular limestone is abundant. The soil displays great bacteriological activity with rapid and vigorous nitrification. Mineral plant food is abundantly present.

All the land within the irrigation area is leasehold, and the lessees have to conform to conditions and regulations that are more or less inseparable from an undertaking that needs more co-operation than among the settlers in more ordinary circumstances. The conditions to be fulfilled are perpetual residence, payment of rent and balance of survey fees, and for value improvements, if any, on the land when applied for. The rent is at the rate of 2 $\frac{1}{2}$ per cent. per annum on the capital value. Farms are not transferable, with certain exceptions, until 5 years' residence has been completed.

As to the cost of water to the settler, it is fixed at 5s per acre-foot during the summer; this water rate is to be reduced by one half during the settler's first year of occupation, then increasing uniformly until the sixth year, when the 5s rate is required. The operations of farming on the land have now fairly started, and a certain amount of produce has been sent away to market.

The cost of the present scheme in round figures is approximately as follows: main works, £ 1 650 000; subsidiary channels, £ 650 000; cost of land, £ 1 000 000; total cost £ 3 300 000.

1139 - Comparative Manuring Experiments with Crushed Phonolite and Potash Salts. — WÄGNER, F. Dünngungsversuche des Deutschen Hopfbaus mit Phonolithmehl (Kalißilikat) in Vergleich zu 40 % igem Kalisalz in den Jahren 1910-1912. — Praktische Böllter für Pflanzenbau und Pflanzenschutz, Year XI, Part 6, pp. 52-53, 67-70, 77-82. Stuttgart, April-May-June 1913.

An account of three year experiments (1910-11-12) carried out at Geisenfeld, Bavaria, by the German Hop-Growers' Association ("Deutsches Hopfenbauverein") at Geisenfeld, Bavaria. The hop garden which was the site of the experiments was planted in 1908; the soil was humous sand (40 per cent. of fine soil), infertile and poor in potash (0.107 per cent. K₂O per cent. of fine soil). To a basis of sulphate of ammonia, basic slag and air-dried fine soil were added, for comparative purposes, the crushed phonolite prepared by the "Westdeutsche Eisenbahngesellschaft, Köln, Abteilung Steinbrüche Brohl am Rhein", and 40 per cent. potash salts. The crops of 1910 and 1911 were failures owing to reasons unconnected with the experiments.

In 1912 the experiments were recommenced on eighteen plots; in two there were 4 rows of 20 hills, and in six there were 4 rows of 10 hills. Each hill received 100 gms. (3 $\frac{1}{2}$ oz.) of sulphate of ammonia, 150 gms. (1 oz.) of basic slag (at 18 per cent. P₂O₅), and 100 gms. (3 $\frac{1}{2}$ oz.) of lime as a dressing. The potash manure was applied as follows.

Plots 1, 7, 13: 284 gms. of phonolite at 9.87 per cent. potash = 28 gms. K_2O
 2, 8, 14: without potash —
 3, 9, 15: 66 gms. potash salts at 46.84 per cent. potash = 28 gms.
 4, 10, 16: 142 gms. of phonolite = 14 —
 5, 11, 17: without potash —
 6, 12, 18: 30 gms. of potash salts = 14 —

Reduced to acres, the results obtained in 1912 are from the financial point of view as shown in Table I.

TABLE I.

Amount of potash	Increase in crop due to the potash manure	Profit (hops at 74s 6d per cwt)	Cost of ma- nure and of picking and drying extra crop	Net profit due to the potash manure
	cwt.	£ s	£ s	£ s
lbs. as potash salts (2 oz. per hill)				
2s 6d per unit.	6.1	22 14	8 2	14 12
ls. id. (1 oz. per hill) id.	3.7	13 17	4 17	9 0
lbs. as phonolite (10 oz. per hill) at per unit.	2.0	7 6	3 4	4 2
ls. id. (3 oz. per hill) id.	0.7	2 15	1 6	1 9

The data respecting the quality of the hops in 1912 are given in Table II.

TABLE II

Potash manure	Points for appearance, lupulin and aroma (3-15)	Commercial value	
		relative (minimum = 100)	absolute (per cwt.)
1s. of potash as phonolite	9.25	101.0	105s
2 " " potash salt	9.75	102.5	106s 6d
3 " " phonolite	9.00	101.5	106s 6d
4 " " potash salt	10.00	105.0	109s
5	9.75	104.3	109s

1140 - **The Sulphur Industry and Trade in the United States.** — PHALENS, W. (U. S. Geological Survey) Sulphur Pyrite and Sulphuric Acid. — *The American Miner*, Vol. XXXIX, No. 3, pp. 41-56 (41-47) Philadelphia, August 9, 1913.

The production of sulphur in the United States since 1880 is shown in the following table.

Production of sulphur in the United States, 1880-1912 in long tons.

Year	Quantity	Value
		\$
1880.	536	21 000
1881.	536	21 000
1882.	536	21 000
1883.	893	27 000
1884.	446	12 000
1885.	638	17 875
1886.	2 232	75 000
1887.	2 679	100 000
1888.	—	—
1889.	402	7 850
1890.	—	—
1891.	1 071	39 600
1892.	2 400	80 640
1893.	1 071	42 000
1894.	446	20 000
1895.	1 607	42 000
1896.	4 696	87 200
1897.	2 031	45 590
1898.	1 071	32 960
1899.	4 313	107 500
1900.	3 147	88 100
1901.	241 691*	1 257 879
1902.	207 874*	947 089
1903.	233 127*	1 109 818
1904.	127 292	2 663 760
1905.	181 677	3 706 560
1906.	294 153	5 096 678
1907.	293 106	5 142 850
1908.	369 444	6 668 215
1909.	239 312	4 432 066
1910.	255 534	4 605 112
1911.	265 664	4 787 049
1912.	303 472	5 256 422

* Including the production of pyrite.

In determining the value of most of the sulphur produced in 1912 current market price in New York was taken and the mine values computed from it. Prices remained fairly constant throughout the year at \$ 22 to 22.50 per long ton for prime Louisiana sulphur.

Quotations on other sulphur per 100 lbs.

	\$	\$
Rolled sulphur	1.85	to 2.15
Flour	2.00	2.40
Sublimed	2.20	2.60

Sulphur was produced chiefly in Louisiana, and in smaller quantities Nevada and Wyoming in 1912. The production of the individual States not be given without divulging confidential information. Utah, which produced on a small scale in previous years, reported no output in 1912. *Trade, Imports and Exports.* — The imports of sulphur during the five years are shown in the following table:

Sulphur imported and entered for consumption in the United States from 1908 to 1912, in long tons

yr	Crude		Flowers of sulphur		Refined		All other		Total Value
	Quan- tity	Value	Quan- tity	Value	Quan- tity	Value	Quan- tity	Value	
...	19 620	318 577	793	22 562	693	17 227	30	4 013	362 379
...	28 800	492 962	770	23 084	966	26 221	53	7 565	549 632
...	28 656	496 073	1 024	30 180	1 106	25 869	47	6 489	558 611
...	24 200	434 796	3 891	83 491	985	24 906	68	9 643	552 836
...	26 885	494 778	1 311	39 126	1 665	40 933	66	9 137	583 974

Crude sulphur imported from the following countries, from 1910 to 1912, in long tons.

countries whence exported	1910		1911		1912	
	Quantity	Value	Quantity	Value	Quantity	Value
...		\$		\$		\$
U.	5	160	—	—	—	—
Kingdom	7	199	II	248	—	—
...	10 704	201 993	8 031	156 157	2 348	46 003
U.	17 377	283 232	16 185	279 991	24 505	447 946
countries	554	10 404	23	329	32	829

The exports during the last three years were as follows:

*Total exports of sulphur from the United States
from 1910 to 1912, in long tons.*

Year	Quantity	Value
1910	30 742	552 041
1911	28 103	545 420
1912	57 736	1 076 414

It is to be noted that in 1910 the sulphur production of the United States amounted to 31 47 tons; the imports during that year were 167 696 tons which 166 285 were crude sulphur chiefly from Sicily. Thus the domestic production amounted to 1.84 per cent. of the sulphur consumed during the year, while in 1912 against a domestic production of 303 472 tons the imports amounted only to 29 927 tons, the domestic production constituting 9 per cent. of the consumption, and the imports less than 9 per cent. Moreover in the same year the excess of exports over imports amounted to 2 tons and the balance of trade in favour of the United States was \$ 49. The imports from Italy were only 8.7 per cent. of the total, while those from Japan amounted to 9 per cent. For the year 1912 it is estimated that the output of that country cannot be far from 40 000 tons, and it is believed that with the completion of the Panama Canal, United States sulphur will practically displace foreign sulphur on the Pacific Coast (California).

Further development. — Some new factors of the American sulphur industry are the foreign expansion of the Union Sulphur Co. of Louisburg and the new sulphur mines in Texas and in Wyoming.

The Union Sulphur Co. is reported to have negotiated with the authorities of Rotterdam (Holland) for the leasing for twenty-five years of a suitable tract of land having access to one of the harbours upon which to build a sulphur mill and other buildings. The city has offered a tract of land 330 x 420 feet with dock facilities on the Maas Haen, for which an annual rental of \$ 4200 is asked. The firm contemplates making Rotterdam its headquarters in Europe, and already a new refinery with grating and storage facilities is being built. During 1912 the company is said to have acquired storage facilities at Hamburg (Germany). Besides recent additions to its European distributing centres the company has refineries and storage plants at Marseilles and Cetee in France. These will be supplied by the company's own fleet of ships, to which two more were added in 1912.

In 1909 and 1911 the occurrence of sulphur near Bryan Heights at the mouth of Brazos River, in Brazoria County, Texas, was reported. At

operations however were not begun till November 1912 by the Free-Sulphur Co. The work has been somewhat intermittent owing to difficulties inherent in the beginning of an operation of this kind.

The sulphur is to be obtained by a process similar to that employed in Iana, that is the sulphur is melted in the ground by superheated water pumped to the surface by an air lift. Up to the middle of February seven wells had been sunk.

Kryan Heights is well located for the exploitation of the sulphur. It is $3\frac{1}{2}$ miles from the Freeport harbour. The detailed results of the operations have not yet been published, but it is reported that sulphur deposit was found at a depth varying between 900 and 1100

The sulphur beds themselves ranged in thickness from a few inches to feet. Fuel oil will be used in the machines for raising the sulphur and it can be delivered at Freeport at a low cost.

Other sulphur deposits have been found in Wyoming, but it is still doubtful whether they can be utilized unless the local demand becomes

lastly the deposits of sulphur situated on White Island in the Bay of Ily, New Zealand may, prove of interest for the markets of the Pacific. Work began on these deposits in April 1912 and the tonnage of sulphur extracted in them is very large.

- Experiments on the Availability of Glucosamine Hydrochloride as a source of Nitrogen for the Nutrition of Corn (*Zea Mays*) and Beans (*Phaseolus multiflorus*). — HAMLIN, M. L. in *The Journal of the American Chemical Society*, Vol. XXXV, No. 8, pp 1046-1049, Easton, Pa., August 1913.

Two sets of experiments were carried out with 46 and 24 plants respectively, and showed that glucosamine could not be utilized as a source of nitrogen in plant nutrition, owing either directly to its own characteristics, or indirectly to conditions it may have caused, such as the growth of some bacteria which frequently appeared in the glucosamine solutions.

- New Selection Varieties from Alpine Forms of Fodder Grasses. — VON WERNER, Tz. in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 790-820, 2 figs., 10 plates. Vienna, July 1913.

I. INFLUENCE OF THE ALPINE CLIMATE ON PASTURE GRASSES.

Specific alpine plants show a number of the most varied and characteristic morphological and physiological modifications, which are to be attributed primarily to the effect of the alpine climate, and according to Naegeli should be regarded as "adaptation characters", in distinction to differences in organic characters which are not directly connected with adaptation to special circumstances, and are more constant.

The writer has for many years been carrying on experiments and studies at the Sandlingalp in the Northern Alps, at an altitude of 1400 m. (4700 ft.); he has shown that on the whole a number of the most valuable and important species of pasture grasses from the plains, and especially the wild

forms from higher ground, when grown under alpine conditions, gradually give rise to other forms differing in morphological and physiological characters from their valley-bred ancestors. The most interesting point, and one of greatest value from the agricultural standpoint, is that by means of continued selection, bearing on the most important characters for the plants (resistance to cold, yield of fodder, tillering, early development), these characters may be further intensified and prove constant under alpine conditions (sub-alpine vegetation region) even after 20 years' cultivation in this way new varieties of these cultivated plants may be raised.

When it is also taken into consideration that many of the parent plants dating from 1891 which have undergone this gradual transformation still growing in the experiment garden on the Sandlingalp, it appears to the writer that his selection experiments with Gramineae may be regarded further and conclusive proof of the truth of the theory advanced by Lamarck and upheld by C. von Naegeli, that environment has a direct effect upon the individual plant and that modifications arising from direct environmental influence are transmissible.

The persistence and transmission of these acquired characters has certainly resulted in all the forms of Gramineae obtained by the writer through selection; partly through mass selection and partly through line selection based on special forms and qualities.

The yearly increasing deviations in all the species and varieties consist in the appearance of purple colour on the nodes, the leaf-sheaths and flowering glumes, and then in the increasing production of sterile (shoots) and enhanced tillering generally (Bestockungszahl) (1), larger number of leaves, increased breadth of the leaves, shortening of the internodes, also in the formation of special means of protection, as the waxy cover of cocksfoot (*Dactylis glomerata*) and *Sanguisorba dodecandra*, the reductio-serration of the leaves (*Bromus erectus* and *Deschampsia caespitosa*), finally a reduction of the vegetative period and displacement of the physiological phases in general.

In order to ascertain as far as possible the relations of the climatic influence to these alterations in the alpine grass forms, the most important factors of the alpine climate, *viz.* temperature, insolation, humidity of air, rainfall, and the chemical light intensity, were observed regularly during the vegetative period, and it was found that certain direct adaptations depend partly on single and partly on combined climatic factors.

It can be affirmed now that without doubt, chemical light intensity plays a very important part among the climatic factors of alpine districts and that it directs the formative process of certain organisms of especially variable species, at all events during the earliest stage of their development, giving the impetus to the characteristic laying down and the later shape of the leaves and stem, that is of the sheath and blade in the one case,

(1) The writer understands by this the number of sterile shoots to every culm of an individual plant. Translated lower down as "tillering value".

internodes in the other. The shortening of the latter leads necessarily to more tufted habit, owing to the side shoots being thereby brought to the main stem; this is shown by most Gramineae cultivated under influence of the alpine climate.

THE MOST IMPORTANT ALPINE VARIETIES SELECTED FROM PLANTS
FROM THE PLAIN.

The writer has bred the following new varieties:

- 1. *Agropyrum caninum* Schreb.: a variety bred from the wild form of rye; it resembles Italian ryegrass, but is a persistent fodder grass (especially adapted for alpine green soiling mixtures and alpine meadows).
- 2. *Arrhenatherum elatius* Mert. et Koch: very suitable for alpine meadows; selected from wild forms.
- 3. *Arrhenatherum* var. *bulbosum* Koch: a variety well adapted for alpine meadows, selected from wild forms.
- 4. *Avena pubescens* Huds: persistent, leafy variety, bred from wild forms.
- 5. *Dactylis glomerata* L.: alpine form with bloom-covered leaves; derived from wild mountain plants; resistant to rain (ombrophilous).
- 6. *Festuca arundinacea* Schreb.: alpine form with the typical characteristics of the species; leaves soft; very productive, especially suitable for alpine meadows.
- 7. *Festuca pratensis* Huds.: from wild plants, coming from mountain meadows; a very productive and persistent alpine selected variety.
- 8. *Festuca rubra* var. *fallax* Hack.: from this tufted variety of *Festuca rubra* an alpine form was bred with purple nodes and variegated outer leaves; it has soft culms and narrow leaves, is cold-resistant and very productive.
- 9. *Lolium perenne* L.: a persistent alpine form with purple nodes, and purple leaf-sheaths; selected from wild individuals growing on the mountains.
- 10. *Phleum medium* Brügger: a very productive alpine form adapted to meadows and pastures.
- Finally we must mention a little-known fodder plant grown by the writer in his alpine experiment garden:
- 11. *Sanguisorba dodecandra* Mor.: from Val Ambria, Southern Switzerland; the alpine form has bloom-covered leaves and reddish-violet petioles; it is a cold-resistant green crop for the Alps, especially useful in combination with the alpine form of *Agropyrum caninum*, and has a great future.
- Special mention should be made of some species of plantain grown by the writer on the Sandlingalp and subjected to further selection on the Kragl during the last three years; of these the most important is *Plantago lancea*, an excellent pasture plant of tufted growth; many varieties have arisen during cultivation at lower altitudes. These will be dealt with by the writer in a later paper.

III. BEHAVIOUR OF ALPINE FORMS (ACCLIMATISATION RACES) WHEN CULTIVATED AT LOWER ALTITUDES.

The writer has grown these alpine selection varieties under more favourable vegetative conditions, viz., in more sheltered and sunny spots in order to obtain more seed than could be hoped for, especially in ripening varieties at an altitude of over 1,400 metres.

On the establishment of the Kragl farm (under the writer's direction) in 1908, selection experiments were begun by means of sowing the required alpine forms and pricking out selected plants, of at least two years of age, from the Sandlingalp garden. Kragl was instituted merely as a modern pasture-farm for the furtherance of cattle-breeding interests, but primarily to serve in the promotion of botanical research the seed selection of fodder plants.

The selection garden there lies some 820 m. (2700 ft.) above sea level; it was formerly a State nursery for forest trees, so that the ground was able for such experiments without the repeated working necessary in the case of the Sandlingalp. The composition of the soil and the manure were the same as in the alpine experiment garden.

The following important facts are shown by the elaborate tables set up by the writer respecting the development through further selection of the forms obtained at Kragl, as compared with the alpine selection varieties.

1. In general, the number of culms per individual is considerably less in the varieties which have been further cultivated than in the parent forms, while the number of leafy shoots (and therefore the tillering) has decreased, with the exception of *Festuca rubra* *f. fallax*, *Poa serotina* and *Phleum Michelii*, in which the tillering value is higher.

If the number of the culms and leafy shoots of the parent alpine be taken as 1, the following series represents the proportional number of the varieties which have been further cultivated.

	Culms	Leafy shoots
<i>Festuca pratensis</i>	6.38	0.66
" <i>arundinacea</i>	6.23	0.40
<i>Agropyrum caninum</i>	5.67	0.25
<i>Phleum Michelii</i>	4.12	1.63
" <i>medium</i>	1.82	0.56
<i>Poa serotina</i>	1.80	1.80
<i>Festuca rubra</i>	1.17	0.86
" <i>f. fallax</i>	1.07	1.56

2. A remarkable character of all these varieties under further cultivation is the greatly increased yield of seed, which in *Festuca arundinacea* is twenty-four times as much as in the parent alpine form.

In correlation with this is the increase in the number of spikelets per individual in the new varieties.

3. In like manner the fodder yield increases in the case of the new varieties, though not to the same extent as the extra seed production; in the new variety of *Festuca pratensis* it reaches more than ten times as much as of the parent form.

4. If, as in the case of the number of culms and leafy shoots, 1 is taken as the yield of the parent alpine form per unit area, we get the following for the seed and fodder production of the new kinds. These tables clearly demonstrate the superiority of the latter, not only over their parent forms, but also in comparison with the commercial varieties. A comparison between the two tables further shows that the highest seed yield does not coincide with the largest fodder production.

Seed yield of the selected varieties.

	Kragl selected variety	Commercial or original variety
<i>Festuca arundinacea</i> .	23.9	4.4
* <i>rubra fallax</i> .	16.6	5.5
<i>Agropyrum caninum</i> .	11.2	—
<i>Phleum medium</i> . . .	9.3	5.7
<i>Festuca rubra</i>	7.1	3.1
<i>Phleum Michelianum</i> . .	6.7	1.1
<i>Festuca pratensis</i> . . .	3.9	1.4
<i>Poa serotina</i>	2.7	1.8

(Yield of parent alpine form at the Sandlingalp = 1).

Fodder yield of the selected varieties.

	Kragl selected variety
<i>Festuca pratensis</i> . . .	11.8
* <i>arundinacea</i> .	8.3
<i>Agropyrum caninum</i> .	3.6
<i>Poa serotina</i>	2.6
<i>Phleum medium</i> . . .	2.2
* <i>Michelianum</i> . .	2.2
<i>Festuca rubra</i>	1.5
* <i>rubra fallax</i> .	1.3

(Yield of parent alpine form at the Sandlingalp = 1).

The new varieties retained their acquired characters for three generations during further selection and multiplication, and these modifications became intensified. These facts have been determined by the experiments of practical breeders.

IV. THE PRINCIPAL RESULTS OF THIS WORK.

These may be summed up under three heads:

1. During the further cultivation, in sheltered, sunny spots in the mountains, of alpine forms bred under the influence of the alpine climate

from lowland grasses, new forms again arise ; from these can be bred varieties which are not only far more productive than their parent alpine forms, are also superior to the best kinds in use or in the trade.

2. The superiority of these varieties is chiefly shown by their seed yield. Thus, the further cultivated form of *Festuca arundinacea* in the third generation bears 23 times as much seed as its alpine parent. The further cultivated varieties have, as a rule, also exceeded their alpine parents in fodder production.

3. Experience shows that the seed production of all cultivated grasses decreases considerably, normally in their fourth year, and this falling off also occurs in the case of the new selection varieties ; to obtain a larger and purer seed yield it is therefore necessary to renew the multiplication after some years by either transplanting or sowing new selected seed from lowland selection garden ; the latter must also be restocked with the variety in question taken from the first selection ground, i. e. the alpine experimental garden. This entails a new and important interrelation between the alpine seed-breeding garden and the further cultivation of the alpine varieties in lower places, and also manifests the importance of the alpine seed-garden for the cultivation of fodder in valley farms.

If the data so far obtained do not permit of a decisive opinion being formed, especially as regards the lasting worth of the new selected varieties, they are yet not to be despised, for they open up a new field of work for both scientific research and practical agriculture.

1143 - Selection of Pigeon-Pea or Rahar (*Cajanus indicus*). — Mr. S. Improvement of Rahar by Selection. — *The Agricultural Journal of the Department of Agriculture, Bihar and Orissa*, Vol. I, No. 1, pp. 25-29 + 4 plates. Patna, April 1912.

Rahar is held in high esteem as a food in India. Its seed, young shoots and leaves make excellent fodder for cattle ; its branches are used for roofing, basket and thatch work and the dried stalks for fuel. Its previous importance in the rural economy of the natives makes this plant worthy of study and improvement.

Observations were commenced on Sabour Farm in 1908 with a single variety. It was noticed that considerable variation existed among plants with respect to the following important characters : growth, mark and colour of the plant, plumpness of pod, colour and size of grains, character of the flower. The variations were recorded as follows :

- A. Habit of growth : 1) erect, 2) spreading.
- B. Colour of pods : 1) violet, 2) white, 3) striped.
- C. Fullness of pod : 1) inflated, 2) wrinkled.
- D. Colour of seed coat : 1) reddish-brown, 2) white, 3) blue, 4) spotted.
- E. Size of grains : 1) large seeded, 2) small seeded.
- F. Flower characteristics : 1) standard yellow, 2) standard yellow with red veins.

Among all the multitudinous forms possessing these characters,

He observed a certain degree of correlation. He found the following related characters:

1. Erect type with large grains and entire-coloured pods.
2. Spreading type with small grains and striped pods.
3. Erectness in form with lateness of maturity.
4. Wrinkledness of pod with roundness of grain.
5. Spotted grains with extreme earliness.

Attempts at selection were also made with respect to earliness, wilt resistance and west-wind resistance. Selection work during two seasons had the following results: 1) Early plants have a low spreading habit the foliage and fruits small. 2) No morphological character appeared correlated with wilt resistance. 3) The thick-podded erect forms generally more resistant to the west wind. 4) Large pods and seeds associated with the erect habit of growth.

In the field trials the erect form was always found to be superior to the spreading form; it is now being grown as a general field crop at Sabour.

- Comparative Experiments on Red Clover of Different Origins at the Svalöf Institute during 1907 to 1912. — WIRTE, H. in *Sveriges Utbildnings-tidn.* 1913, p. xi.

Most of the red clover seed imported into Sweden is described as "Silesian" a small quantity as "Russian." The former brand includes not seed from Silesia and neighbouring countries, but also that of Hungary, Austria, France, Italy, North America and Chile. Only the varieties resistant to a cold winter are of use in this country, and for the pastures of 6 years duration, which is the usual system in Sweden except the winter portion, a very hardy and persistent clover is required. Experience has shown that imported clovers vary considerably with respect to their hardiness and persistence, and this has been verified by the experiments conducted at the Svalöf Institute during 1907-12.

Most of the foreign varieties are early in maturity and characterised by erect slightly-branched stems and an early secondary growth, which requires two cuttings to be obtained; but they are of so short duration that the second years' crop is very small.

The largest yields have been obtained from seed from Silesia, Posen, and Bohemia, the Rhenish Palatinate and Galicia, and often the second year's crop has been as large as the first. Moravian seed is somewhat inferior and that of Austria (with the exception of the Austrian countries already named) suffered very badly in the winter. Russian seed was better equal to the Silesian. The Swiss variety "Matten Klee" gave a poor yield owing to its earliness and tenderness. The American varieties of the spreading type have all given inferior yields, but their hardiness varied according to the latitude of their origin. The Italian, Brabant, and above all the English and Chilean clovers, were lacking in hardiness and durability. The late varieties from England and Bohemia matured early but developed somewhat slower than the true Silesian clover.

The late variety, with tall much-branched stems, generally gives only small aftermath, but its total yield for the first year is equal to that of

the early variety; in the second year, in which it gives its biggest, it considerably exceeds it. Owing to its persistence (it will last five years), this variety is the only one suitable for pastures of long duration.

Most of the Swedish varieties were of this type, as also were those of Norway, Finland and North Russia. The foreign varieties, with the exception of those of Finland, were generally inferior to those of Swedish origin. These native varieties showed considerable differences in periods of flowering and yields, the latter character being generally related to their lateness.

1145 — **Manuring Experiments on Alpine Pastures in Carinthia: 1910, 1912.** — SVOBODA, E., of the Laboratory of the Institute for Research and the Education of Foodstuffs of the Duchy of Carinthia at Klagenfurt. — *Zeitschrift für Landwirtschaftliche Versuchswesen in Österreich*, Year XVI, Part 7, pp. 745-750, Vienna, July 1913.

The results of this work and of two previous reports are given together as follows:

1. The soils of all the alps experimented upon were very poor in P_2O_5 and CaO . In 100 gms. of air-dried fine earth there were only in 40 more than 0.1 gm of P_2O_5 . The other eight soils contained considerably less than 0.1 per cent of P_2O_5 , namely 0.003, 0.008, 0.017, 0.019 per cent. The potash content of all the twelve soils was under 0.1 per cent, with a minimum of 0.024 per cent. Only two soils contained more than 1 per cent of CaO , one upwards of 0.3 per cent, one over 0.2 per cent., five between and 0.2 per cent., three under 0.1 per cent.

2. Tilling the Alpine soil gave everywhere good results; no soil can really be more benefited by physical improvement than Alpine soil.

3. In two of the experiments the same fact was observed: that in laying down a new ley on an alp after breaking up the old turf, the grass seeds were sown did not sprout unless they were abundantly manured with farmyard manure or chemicals. After broadcasting, the grasses did not develop sufficiently to form the new turf till three and four years, according to the altitude. The vegetation obtained at last was poor and was composed chiefly of weeds, *Aira* and *Nardus stricta*.

4. With one single manuring of farmyard manure (St) or chemicals alone (K), or of a mixture of both (K+St) the average crop of hay was following during the first five years, in cwt. per acre.

Manures	1908	1909	1910	1911	1912
Unmanured	7.71	8.76	14.01	19.59	1
St	17.44	20.72	19.20	20.89	1
K	18.56	14.30	19.75	27.92	1
K + St	23.34	23.97	21.33	28.11	1

The crops from the unmanured plots are light on account of the impeded state of the soil. Reckoning them at 100 the increases due to the urea are given below.

Year	Stable manure	Chemical manures	Stable and chemical manure
.....	2 to $2\frac{1}{3}$ times as much	$2\frac{1}{4}$ to $2\frac{1}{2}$ times as much	fully 3 times as much
.....	"	100 : 150 to 160	$2\frac{3}{4}$ times as much
.....	100 : 137	100 : 142	100 : 152
.....	100 : 106	100 : 142	100 : 143
.....	100 : 116	100 : 142	100 : 138

In some cases the writer observed extraordinary increases of the crop, such as 4 to 7 times the amount from the unmanured plots. The results in various years confirm each other satisfactorily.

The effect of the stable manure during the first and third years was equal at of the chemicals, and in the second year even better, but in the fourth fifth years it was considerably inferior and barely noticeable. The combination of stable and chemical manures had the best results and during the three years was superior to that of the other manures applied separately; in the two last years however it was of equal value to the artificials. considerably longer duration of the after effects of artificials as compared with farmyard manure is proved beyond all doubt. The after effects of stable manure lasted about three years, those of artificials about only after this period did the increase of crop due to artificials cease to be noticed on some of the alps.

For the practical Alpine farmer—as in general for all farmers—the combination of farmyard and chemical manures is advisable.

5. Respecting the water content of green forage and the ratio between the dry substance in hay the writer noticed variations ranging from 60.4 per cent. of hay in the green forage, while the hay contained 80.3 to 90.1 per cent. of dry matter. The plots that gave the lowest yield, thus the unmanured and the St. plots, gave the driest green forage, the heavier bearing plots (K and K + St) the richest in water, there being a sort of compensation in the higher hay and dry substance content of the smaller crop. On the other hand the quality of the dry straw-like crop of the poorer plots is naturally inferior to that of the juicy forage of the good Alpine meadows, which is always richer in protein. In general it may be said, with the increasing yield of a plot the water content of the crop increases and this may be explained by the fact that the drying power of the sun is not so powerful on a dense vegetation as on a thin and dry one.

Level Alpine meadows bear much more abundantly than those situated on slopes, which is to a certain extent due to the lesser leaching out of plant food from the humus and washing away of the fine earth and to the circumstance that the slopes in some aspects, are exposed to a more intense action of the sun.

The writer mentions another observation made elsewhere: the analysis of three samples of grass which was cut on August 22, 1912, near Malt at different altitudes above sea level:

Height above sea level . . .	7710 ft.	6725 ft.	5905 ft.
per cent	per cent	per cent	
Crude protein	17.90	15.90	12.90
Crude fat	2.62	2.64	1.84
Ash	8.34	6.62	9.58

From the above it would appear that the protein content increases with increase of altitude; this question is sufficiently interesting to deserve more closely studied and on more ample material.

6. The sowing of good forage grasses and clovers on Alpine meadows a measure strongly to be recommended. In the above-mentioned experiments timothy and dog's-tail proved to be the best grasses; they are of slow growth both on limestone and on primary rocks. Fox-tail, yellow and alsike clover grew luxuriantly the first year after sowing, but their growth slackened and they even disappeared completely. In order to prevent this disappearance it is necessary, after the first initial manuring, to repeat every year the application of animal and mineral fertilizers, for already after four or five years, areas which presented a quite different botanical population, lose the best sorts of grasses, get invaded by weeds and end by being covered with the same plants, generally of a poor description.

7. The use on the alps of the best possible artificial, notwithstanding the high cost of transport, which by suitable measures may be reduced, is in the end the most profitable course to pursue, owing to the great increase of crops which they cause and to the length of time over which their after effects extend.

1146 - *Desmodium hirtum*, Leguminous Forage Plant Recommended for the Prevention of the Development of Weeds and as Green Manure Tropical Plants. — SROTH, A. and HARNISCH, H. in *Der Tropenpflanze*, Year 17, p. 430-437. Berlin, August 1913.

This plant is an addition to the number of nitrogen-bringing green manure plants, which grow rapidly forming a dense cover, capable of preventing the development of weeds and of protecting the soil against leaching by torrential rains and the heat of the tropical sun.

The habitat of *Desmodium hirtum* (Guill. et Perr.) is fairly extensive and is found in Natal, German East Africa, Senegambia, Sierra Leone, Togo and Kamerun. It grows from sea level up to an elevation of about 5,600 ft. It is a herbaceous climbing plant, the branches attaining a length of

ft. In German East Africa the plant loses its leaves in July and August and many of the branches die, but in September vegetation starts again, new branches cover those that have died and which go to form an excellent humus.

The production of the seeds is not very easy, consequently the writers recommend the following method. The seeds are sown in a rich, loose, fresh soil; the seedlings are transplanted when about 4 inches high into loose soil. Vigorous plants are obtained which produce numerous cuttings. The writers insist on the necessity of taking only rooted cuttings, and they advise choosing a rainy season for making a plantation and setting the plants 3 ft. apart.

This *Desmodium* is very sensible to the physical state of the soil; it prefers a decided preference for tilled soils and develops much more in plantations than in the wild state.

In a rich soil this leguminous plant forms a cover one foot deep which completely prevents the growth of weeds and thus allows a great省 of hoeing; besides this, *Desmodium* may be utilized as green manure and as food for live stock, sheep and asses being especially fond of it.

Cotton Problems in Louisiana.—COOK, O. F. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 130, pp. 3-14.* Washington, June 21, 1913. The production of cotton in Louisiana is at present traversing a crisis in which the chief causes are the following:

- 1.—The higher cost of farm labour and the difficulty of finding sufficient hands for picking due to the double exodus to the cities and towns to Texas.
- 2.—The boll weevil finds here specially favourable conditions: the prevalence of late maturing varieties of cotton, the great luxuriance of vegetation, the great extent of wooded country, affording unusual opportunities for the hibernation of the insect.
- 3.—The tendency of the cotton industry to replace the long staples by short staples is injurious to the lower Mississippi Valley (Louisiana and Mississippi) which produces the best Upland long-staple of all the cotton belt.
- 4.—The introduction of large public gins instead of the old separate plantation gins had led:

- a) to a mixture of seeds rendering it difficult to secure supplies of pure seed;
- b) to a mixture of various cottons injurious to the quality of the fibre causing complaints on the part of the buyers.

The writer studies the means of improving this state of things.

- 1.—Control of the boll weevil: a) promoting scientific research with object of obtaining long-staple *early* varieties and testing the methods of cultivation calculated to increase this quality (root-pruning, closer planting, etc.); b) organizing communities of planters for the *collective* con-

trol of the insect, which is the only efficient means of obtaining practical results.

2. — *Improvement of the quality* of the produce by means of these good planters, who should rigorously select their seed and strive for a high product.

3. — *Education of the consumer.* The improvements of spinning machinery have made it possible to spin short cotton and produce fabrics similar to those previously made from long staples. But the short-staple fabrics are undoubtedly inferior in strength and durability to the long-staple ones. As this change is against the interests of the consumer as well as the planter of long-staple cottons, and profitable only to the spinner, the public should be illuminated on the subject.

4. Lastly the writer proposes the acclimatization into Louisiana of tropical crops, so that cotton may become a branch of a safer and diversified system of agriculture, which would be especially advantageous for the better utilization of labour.

1148 — *Cotton in India.* — SCHANZ, MAURICE in *Beihefte zum Tropenpflanzen*, Vol. No. 5-6, pp. 439-609, Berlin, August 1913.

This article supplements the monographs already published on Cotton Cultivation in the United States and Egypt.

Historical. — The author outlines the history of cotton cultivation from 800 B. C. Table I shows the effect of the War of Secession in 1861 on the production of Indian cotton.

TABLE I.

Year	Exports	
	Quantity	Value
	tons	millions sterling
1860	170 300	7.3
1861	176 400	10.0
1862	211 100	18.5
1863	245 600	35.1
1864	234 400	36.8
1865	358 350	34.9
1866	189 950	16.2
1867	274 150	19.7
1871	361 250	20.9
1878	148 300	7.7

Many attempts have been made to improve the quality of this fibre the results are now being felt. In particular the author mentions the of the Cotton Supply Association, the British Cotton Growing Association, the International Federation of Master Cotton Spinners' and Manufacturers' Associations, and the Indian Government.

Soils. — In India the three great cotton areas correspond to three great gical formations. 1) The northern zone comprising the alluvial soils e. Bundelkhand and the valleys of the Indus and Ganges, which vary the sands of Sind and the Punjab to the clays of the United Provinces. The middle zone extending from Rajputana to the Dekkan con- of the famous "Regar" or Black Cotton Soil, the richest soil in India. The Southern zone consists of a soil of crystalline origin and comprising ferruginous, red and yellow lands. The "Regar" soil is also found in zone, particularly in the districts of Tinnevelly and Coimbatore.

Climate. — Owing to the monsoons, India receives 90 per cent. of its fall during the summer or south-west monsoon. The distribution of rainfall is very irregular, causing thereby the proverbial famines of dry s; the mean annual rainfall varies from 23 cm. to 358 cm. in the various inces. When there is not enough rain the cotton has to be irrigated. Government has been much concerned with this question and has re- ed the old canals and constructed new ones, so that in March 1912 the length of these canals reached 58 000 miles.

Geographical Distribution. — Cotton is cultivated to some extent ughout India. In Berar one-third of the cultivated lands is given up to crop, in Bombay 10 per cent., in Madras 5½ per cent., Central Provinces per cent., North-West Provinces 4 per cent. Sind 3½ per cent., and the Punjab 2½ per cent. This shows the relative importance of this in each province, while the following figures show the distribution of cotton areas in the different provinces.

Provinces	per cent.
Bombay	25
Central Provinces and Berar	22.5
Haiderabad	13.9
Madras	8.4
Punjab	8
United Provinces	6.2
Central Provinces	4.4
Baroda	3.1
Rajputana	2.1
Other provinces	3.4
	100

Species cultivated in India. — The writer has divided the different genous varieties into three groups: *Gossypium arboreum*, *G. nanking*,

and *G. obtusifolium*. The exotic varieties which have been introduced more or less success are divided into two groups according to the appearance of the seed, thus: a) with covered seeds - *Gossypium hirsutum* (Upk) b) with naked seeds - *G. purpureescens*, *G. vitifolium* and *G. brasiliense*.
 Commercial varieties. — Table III gives a résumé of the characteristics of Indian cottons.

TABLE III.

Name	Colour and appearance	Length mm.	Diameter mm.
Oomras	white-cream, silky	—	—
Khandesh	dirty	10-16	1/16
Berar type	clean	10-25	1/16
Berar special good staple	clean	20-30	1/16
Dholeras	white, silky	15-25	1/16
Broach	white, silky, clean	16-26	1/16
Broach Surtee	very beautiful white, silky . . .	20-30	1/16
Bengal	white mixed with yellow flocks .	13-16	1/16
Sind	clean, yellowish white	13-16	1/16
Punjab	white, half silky	17-22	1/16
Assam	white, very clean and short . .	10-13	1/16
Burma	white to khaki	13-16	1/16
Kumptas	yellowish brown, silky	19-22	1/16
Dharwar American . .	beautiful white, silky	16-20	1/16
Westerns	white to yellow, very dirty . .	20-24	1/16
Northerns	deep yellow to red	20-24	1/16
Cocanadas	reddish brown to white	20-24	1/16
Tinnevelly	white to cream, strong, silky . .	23	1/16

From the point of view of quantity, Oomras are the most important, representing almost half the production of India. The best quality cotton is the Broach, followed by Dharwars; Sindhs and Punjabis resemble Bengal varieties which constitute the lower grades; whilst the Oomras are of average quality.

Area under cotton and yield. — The areas and yields of the various Provinces are given in Table IV.

TABLE IV.

Province	Area under cotton in thousands of acres	Yield in thousands of bales (100 lbs.)
Py	5932	1302
ul Provinces and Berar	4523	910
as	2426	317
ab	1575	346
sl Provinces	1148	425
h	288	121
ta	227	45
pl	89	19
and Eastern Bengal	86	31
Provinces	55	13
and Marwar	51	20
tabad	2888	300
ul Provinces	1314	206
la	762	196
stana	393	127
re	154	19

Whilst the yield per acre for the United States is 175 to 215 lbs. and of Egypt 340, it is only 100 for India.

The yield varies considerably from the South to the North, where it is greatest. Table IV shows this variation and the effect of irrigation.

Yield of lint. — The quantity of lint amounts to about one-third of the yield of the crop : this proportion varies from about 25 per cent for Rozzi to about 41 per cent for Comilla.

TABLE V. — Yield of cotton in lbs. per acre.

Province	With Irrigation	Without Irrigation
Sindh	308	—
Ajmir and Marwar	—	192
Berar	—	144
United Provinces	190	130
Bombay	—	100
Punjab	109	80
Upper Burma	—	80
North-West Provinces	183	72
Bengal	—	75
Central Provinces	—	75
Mysore	—	52
Madras	—	45

Seeds. — The ratio by weight of the seeds to the fibre is about 7. Apart from their use for sowing they are largely used for feeding on the spot (4 to 5 lbs. a day). The exports from Bombay for feeding increasing each year.

Year	Exports of Cotton Seed
1897-98	28 360 cwt.
1900-01	225 000 "
1910	6 000 000 "

Cultivation — The cotton plantations are not in the hands of European planters, the crop being grown by the inhabitants. Sindh and Madras are the only Provinces in which the perennial species are still grown. Seeds, often mixed with other grains, are generally sown broadcast in Central and United Provinces, Berar and the Punjab.

A rotation is practised consisting of wheat, millet, oleaginous and milletous plants. About 10 lbs. of seed is sown per acre. Sowing is usual in June, but there is probably not a month in the year in which sowing does not take place in some part of India. The growing period is similarly variable. The Oomra variety matures in 4 or 5 months, whilst the Sa Broach requires 8 months. The first picking generally gives the best quality and the second the greatest quantity, whilst the third is inferior in quality and quantity.

There is not the same uniformity in production of cotton in India as there is in Egypt and the United States, so that the writer studies different districts in detail.

Principal Cotton Centres.

1. *Punjab.* — The soil is generally alluvial or sandy, and owing to the rainfall of 600 mm. (150 to 180 mm in the West) the cotton crop requires irrigation. The canals are well developed and irrigate about seven m acres. The Chenab canal, the greatest in India, has transformed 70 years ago an arid desert near Lyallpur, into a fertile region. of this land is held by small owners (with 4 to 6 acres) who apply principles of modern agriculture, and the yield is considerably greater in this district than in most of the regions of India.

2. *Bombay Presidency.* — a) *Sindh.* — This district resembles Egypt in a desert traversed by a river and a fertile valley. The mean rainfall being only 180 mm, irrigation is indispensable; cotton is limited to districts of Haiderabad, Thar and Parkar, where irrigation is possible. The inhabitants cultivate only a third or even a fifth of their land, the remainder allowing the land to be fallow for 5 years.

On the hill lands the Sailabi method is practised: first irrigation, then followed by frequent irrigations, because the soil does not retain the water. The Bosi method is applied to the inundated area which is not irrigated after the sowing;

Since 1852, numerous experiments have been made to introduce varieties having a longer staple, but disease and atmospheric conditions have been unfavourable to their success. The experiments have shown that when the irrigation canals are finished, it will be possible to cultivate varieties of cotton such as Mitaifi, which, with careful harvesting and preparation, will equal the "fully good fair brown," Egyptian. This would yield 60 rupees (80s) per acre in place of the 42 (57s) which is obtained in Sindh under the same conditions. It is also hoped that similar success will be obtained with the Upland, which required only 12 to 13 irrigations in place of 22 required by Mitaifi.

b) *Gujerat North or Kaira-Ahmedabad.* — A sandy soil with a rainfall of 950 mm. produces a yield of raw cotton (variety Dholera) of 200 lbs per acre without irrigation, and up to 1200 lbs. with irrigation. Most of this crop goes to the spinning mills of Ahmedabad.

c) *Gujerat South* — The famous variety Surtee Broach originated in this region. It is the best native variety, but Surat Deschi Broach is the most valued. The soil is a black clay, only tillable after the rains, which amount to 1150 mm. per annum. Irrigation is not practised; the people are diligent and the system of cultivation is the best in India.

d) *Deccan of Bombay.* — This supplies most of the Bombay requirements. It has a clay soil and a mean rainfall of 700 mm. Cotton is the product of the North and the variety Oomras is mostly grown.

e) *Mahratta South or Karmatak.* — This region comprises the southern part of the Bombay Presidency. About 600 000 acres are given up to cotton and two varieties are cultivated: 1) Kumptas, giving 300 to 400 lbs of raw cotton with a yield of 25 to 29 per cent. of lint, is a variety of cotton and there is a tendency to substitute for it the true Broach which is 100 lbs. p. acre, containing 34 per cent. of lint, with a market value

12 per cent. higher; 2) American Dharwar; this variety has degenerated and is being replaced by Cambodian.

3. *United Provinces*.—The western portion (Agra), which is well watered all the year, is the most important for cotton. About one-third is irrigated and the remainder receives an annual rainfall of only 820 mm. Some of the land is held by small owners in plots of 5 to 10 acres. The variety cultivated is Bengalee. Attempts to introduce varieties of long staple have been unsuccessful.

4. *Central Provinces and Berar*.—This is the centre of the cotton cultivation of India, and cotton here ranks second in importance in the textile trade. Three principal varieties are cultivated: a) Bani, one of the most beautiful cottons of India with a length of staple from 25 to 28 mm., can be spun up to No. 40; it is being abandoned, an account of low yield of lint (26 to 27 per cent) in favour of the more productive b) Berar Jari; this variety yields 35 per cent of lint, is very popular in the market on account of its woolly appearance, and is used in the manufacture of "Vicuna" cloth. It is a mixture of about 65 different varieties, among which are *G. malvensis*, *G. vera*, *G. rosea*, *G. rosea cuchia* and Bani. c) Bajra, a Georgia-Upland variety obtained at Calcutta and the most popular of all the exotic varieties tried.

The most important cotton region is the valley of Payanghat, where the best product is obtained and 40 per cent. of the arable land is reserved for this crop. The rainfall varies from 750 to 1250 mm., and it is generally not necessary to irrigate. The methods of cultivation are quite primitive; cracking of the clay soil during the dry season takes the place of cultivation. Sowing takes place in June and the crop is harvested in October, as from November onwards the drought induces tearing of the leaves.

5. *Madras Presidency*.—The annual rainfall is 700 to 760 mm. for Tiruvelly, 630 mm. for Coimbatore and 480 to 540 for Bellary; this is not always adequate and requires to be augmented by irrigation. The varieties cultivated are: a) Uppams, sown in May and July on the black cotton soil; they consist of about 8 different varieties, and are grown chiefly in the Nellore and the south of Madura. b) Nadam or Ladams, a poor variety sown in September and November in red sandy soils; produces the cotton known as "cocanadas". c) Tellapatti (Uppam \times Bour) yields Westerns (Bellary and Karnal) and Northern (Tadipatti) Salems, a mixture of Uppams, Ladams, and Bourbon, met with in Coimbatore. e) Cambodian has made rapid progress:

Years	1908	1909	1910	1911	1912
bales of 500 lbs.	40	1 650	7 500	30 000	80 000

On land manured and irrigated it gives 1250 to 1600 lbs. of raw cotton per acre, with a yield of 33 to 35 per cent. of lint; whilst the native varieties give 60 to 100 lbs. of lint, Cambodian reaches 500 and more, and therefore fetches 1d a lb. more.

Exports. — Cotton is an important factor in Indian commerce. In 1912 its export reached the value of 406 million rupees (27 millions sterling) made up as follows.

	Value in thousands of rupees.
Raw Cotton	293 341
Seed	15 191
Thread	75 901
Goods in bales	19 666
Shawls and handkerchiefs	1 525
Various	695
	406 319

The article concludes with a study of the cotton trade and industry in Indian Empire.

The Kapok Industry. — SALEEBY, MURAD M. *The Government of the Philippine Islands, Department of Public Instruction, Bureau of Agriculture, Bulletin No. 21, pp. 1-14, plates VIII.* Manila, 1913.

The Bulletin is written to supply the steadily increasing demand for information concerning the culture of kapok. It is based on experiments in Java and the Philippines.

The kapok tree is extensively cultivated in the East Indies, Tropical Africa, Ceylon, Java and the Philippines. There are some eight species of *Ceiba* known in Tropical America, but their product is inferior to that of the true kapok, *Ceiba pentandra* Gaertn. (= *Eriodendron anfractuosum*). It is sometimes confused with the species of the allied genus *Bombax*, of which there are 40 or 50 species all yielding floss of an inferior quality. They can be distinguished by their much greater size (the true kapok seldom exceeds 40 feet) and their much larger red flowers, 3 to 4 feet in length.

Seed selection. — The majority of the trees in the Philippines are propagated by cuttings. Some are raised from seed without the slightest regard to the selection of good seed of desirable parentage, and this accounts for the lack of uniformity in size, number and development of pods. Seed should be selected from trees more than 5 years old, of rapid growth, early and regular fruiting habits and which are heavy yielders.

The following table shows the wide variation in the characters of the

Climate. — Successful cultivation can only be accomplished in the tropics and the best results are obtained at an altitude below 1,500 feet. It is essential to withstand comparatively long periods of drought and from the first appearance of the flowers until the pods have been harvested a period of dry weather is essential. Continuous showers of rain during this period, especially in the latter part of it, often seriously interfere with the development of the flowers and damage the floss. Strong winds, particularly typhoons, cause much damage to the long heavy horizontal branches and often uproot the

Length of pod mm.	Total weight of pod gms.	Weight of floss gms.	Number of pod
152	39.5	7.0	14
137	33.5	5.9	15
129	30.0	5.0	16
113	27.0	4.9	10
106	24.7	4.7	18
101	17.5	3.0	7

Cultivation. — This tree flourishes in a wide range of soils, but the results are obtained from a well-weathered volcanic soil. Inferior are generally considered unsuitable for planting on a large scale, and to the somewhat low returns from kapok it does not justify itself on a soil unless grown as a subsidiary crop.

Cuttings should not be of the same season's growth; they should one half to 2 metres (18 in. to 6 ft. 6 in.) in length. They are planted 50 cm. (20 in.) deep at the beginning of the wet season. Trees grown cuttings generally yield a crop 6 to 12 months earlier than those from seed propagation has distinct advantages in healthier trees, more ductile and resistant to wind and pests. Seeds are sown at the beginning of the wet season in hills 15 cm. (6 in.) apart. Until the seedlings have attained a height of 12 to 15 cm. (5 to 6 in.) they require shade plots. They are ready for transplantation at the age of 10 to 12 months. In transplanting, all the leaves should be removed and the stem cut back to a height of 50 cm. (20 in.). The trees should be planted in straight lines 6 or 6 $\frac{1}{2}$ metres (20 or 22 ft.) each way. No cultivation is required established, unless some intermediate crop is grown. As secondary the following are recommended: Maguey, sisal, henequen, Mauritius

Harvesting. — The first crop is obtained between the third and fourth year; normal crops are borne in the sixth and seventh years, with increasing yield up to the thirtieth year. Harvest must be completed by June before the wet season. The pods are harvested when light brown and wrinkled. Unripe pods yield floss lacking in lustre and liable to fermentation, while over-ripe ones yield a dull floss lacking in elasticity. The floss must be sorted, graded, and cleaned. Hand cleaning is very tedious and is now superseded by specially constructed machinery.

Marketing. — It is generally sold under two classes, cleaned and uncleaned. Each class is further subdivided into grades thus:

A. Cleaned: 1) extra; 2) good (prime Java), or first quality; 3) second quality; 4) damaged.

B. Uncleaned: 1) good, or first quality; 2) ordinary or fair quality; laged.

he bales are made of about 10 cubic feet capacity and weighing in 80 and 100 lbs. To effect this, a pressure of 80 000 lbs. is required. *reduction.* — Java and the Philippines are the chief countries export-
pok, and the amount exported is but a small fraction of the quantity
ed.

Years	Total exported in tons	
	from Java	from the Philippines
.....	4 400	—
.....	4 675	—
.....	6 300	4
.....	5 875	13 $\frac{1}{2}$
.....	8 250	37
.....	6 900	27
.....	8 000	10
.....	7 930	30
.....	9 906	98
.....	10 235	31 $\frac{1}{2}$

he exports from British India and Ceylon amounted to 200 tons in
nd this amount has not increased since ; the product is decidedly in-
to that from Java.

ield. — From average trees of normal growth under seven years
the yield is estimated at 350 to 400 pods. Trees from seven to ten
should yield 600 pods or more. In some cases 150 pods yield 1 kilo
s.) of floss, but the average is more nearly 230 pods per kilo. Thus
are of land containing 280 trees should yield about 100 000 pods, pro-
3 450 kilos of clean kapok per year. In the tenth year this would
reased to 640 kilos. The yield of seed is double that of the floss.

by-products. — The seed is roasted for food by the natives of India
es of famine. The Chinese and Javanese extract an oil from the seed,
is used for soap making and adulterating other oils, whilst the resi-
s used as a manure or as cattle feed. Analysis shows that the seed
ins about 2 per cent. of oil.

The trunk is used for telegraph poles and as a support for pepper plants.
ood, which is light and soft, is used for tanning leather and other minor

purposes. It also yields a dark red opaque gum which has medicinal purposes. The bark contains a reddish fibre sometimes used for tying purposes.

Enemies and Diseases. — It has few serious enemies. *Dysdercus cingulatus* Fabr. attacks the pods, and a species of *Helopeltis* attacks the leaves. The worst enemies are bats and monkeys. No fungus or bacterial disease has yet been reported as attacking the kapok tree.

1150 — **The Cultivation of Sisal Hemp in German East Africa** (1). — By WERNER FRIEDRICH in *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, No. 70 pp. Berlin, 1913.

Historical. — In the agricultural annals of the German colonies there is perhaps no example of so rapid a development as that of sisal. In 1898 Hindorf, on behalf of the German East Africa Company, bought in Pongwey 1000 sisal plants which were sent to the Kikogwe plantation near the mouth of the Pangani; of this number only 62 took, and this is the origin of cultivation in German East Africa which in 1912 occupied 52750 acres.

Extent. — In this colony sisal is cultivated: 1. In the North along Tanga-Moschi and Korogwe railways at the mouth of the Pangani. 2. From Dar-es-salam to Kilossa. 3. In the South in the Lindi Mikindani region near the mouth of the Rowuma.

After ceare, sisal is the most important industrial crop of this region.

	Area		Value of Ex
	Planted	Bearing	
	acres	acres	
Ceare	80 724	28 469	233 13
Sisal	52 697	28 067	221 002

Progression of the Exports of Sisal.

1901	15 tons
1905	1 400 "
1910	7 000 "
1911	10 000 "
1912	16 000 "

Varieties. — An unsuccessful attempt was made to introduce sisal from Yucatan: *Agave Fourcroydes* (Lemaire) or *A. elongata* or *A. rigidula* var. *elongata*. At present the only variety grown comes from Florida (called "tropical"); it is the same as "Henequen verde" of the Spaniards or "green Sisal" of the Germans; its botanical names are *Agave Sisalana* Perrin or *A. rigidula* var. *Sisalana*.

(1) For conditions of soil, cultivation etc. see also a report of a journey instruction by Hr. Brück in No. 250, B. March 1913.

mate. — In German East Africa, sisal can be cultivated up to 1480 over sea level, but the best results are obtained below 660 ft. The of rainfall may vary from 39 to 48 inches, and it may even sink inches if the moist and dry seasons are sharply separated.

sition of German East Africa in the world's market of Agave fibre.

Henequen (Yucatan sisal)	136 766 tons
Sisal (Green sisal) :	
German East Africa	15 700 "
Java	3 900 "
Bahamas	3 100 "
Hawai	492 "
Papua	295 "

Elaeis Fruits without Stones. — GATIN, C. L. in *Journal d'Agriculture tropicale*, ar 13, No. 145, pp. 205-208. Paris, July 1913.

ll seedless fruits are called *parthenocarpic* and the phenomenon which in the production of fruits without seeds is known as *parthenocarpy*. *Parthenocarpy* is said to be *vegetative* when the pollen does not come contact with the pistil; and *stimulative* when the pollen coming contact with the stigma does not cause fecundation but only a slight lus.

Varieties of Elaeis nigrescens.

Varieties	communis (A. Chev.)		pisiformis (A. Chev.)	Coriaria (A. Chev.)
	typical form	form with thin shell		
{ 1) oily pulp, proportion by weight . . .	48 %	68 %	84 %	85 %
	large thick shell	tendency to grow smaller	small, shell very thin, sometimes absent	small, thin shell
2) stones . . .				
al { 1) proportion by number . . .	1/10	1/10	rare	2/3
2) characters . .	small, pulp: not very oily: very hard stone	oily pulp: tender stones		almost as large as the normal fruit, pulp oily

The parthenocarpic fruits of *Elaeis* seem to belong to this latter class. A closer knowledge of their production would be of great interest from the point of view of the study of the biological conditions attending upon the production of varieties.

The subspecies *Elaeis virescens* will not be considered, not being of interest from a cultural point of view.

The table on the preceding page shows the difference between the several varieties of *Elaeis nigrescens*.

This table shows two points upon which selection should bear.

1) *Normal fruits*. The *pisifera* variety is particularly interesting for reduction of its stones.

2) *Abnormal fruits*. A special position must be accorded to the *Canariensis* variety, which shows a considerable proportion of fruits without stones.

1152 - Contribution to the Study of the Castor-oil Plant. — RIGOTARD, L. in *Annales Coloniale*, Year 1, No. 1, pp. 15 to 21. Paris, July 1913.

The writer gives some data as to the yield in oil of castor-oil seeds in French West Africa.

Guinea: Brown mottled seeds; oil from the whole seed 42.50 to 44 per cent.

Ivory Coast: Brown mottled seeds; stems brown or red. Oil: 43.36 to 44 per cent.

Upper Senegal, Niger. — Several varieties (blood-coloured castor, of Brazil, Zanzibar, etc.): 41.7 to 54.6 per cent. This latter figure, which corresponds to 64.77 per cent. of oil in the kernel, has been obtained from that came from Brazil and were cultivated in French West Africa. In term of comparison it is stated that Indian castor gave an average of 47 per cent.

1153 - Plantation Rubber in Hawaii. — ANDERSON, W. A. in *Hawaiian Agricultural Experiment Station, Press Bulletin*, No. 44, pp. 1-12. Honolulu, July 1, 1913.

This Bulletin contains the last results obtained in the Nakua plantation.

1. *Distance*. — It is more advantageous to plant closely and subsequently thin out until those that remain are 20 by 20 feet apart, than to plant trees at once at this distance. The chief advantage of the system is that it allows selection by means of thinning. The disadvantage of less union of the stand due to selection will be amply compensated by the increased yield during the first years (owing to the greater number of trees).

2. *Multiplication*. — In order to make a new plantation the way is to use selected cuttings taken from the best yielding trees.

3. *Cultivation*. — The control of weeds by means of hoeing is too costly and causes loss by erosion; the most practical method was found in the use of soda spray, provided it be not allowed to touch the stems of Ceara trees under two years of age or of Hevea trees at all. The aeration of the soil by means of dynamite costs only 15 to 20 dollars an acre, and does not cause much erosion.

4. *Tapping*. — Up to now the best way of tapping Ceara consists in ringing the outer bark in narrow vertical strips and tapping these strips incision, allowing the latex to coagulate on the ground. It is hoped that some type of container will soon be found.

5. *Curing* — This operation has a very great influence on the quality of the product. Drying in the air at ordinary temperature has not given a uniformly good product; it should be completed by the vacuum dryer at special temperatures not greater than 120° F.

6. *Value*. — When it is properly prepared, Hawaii Ceara commands a price not much inferior to those of Ceylon plantation, namely about 10 per cent. less.

— Experiments in Manuring on a Tea Estate in Darjeeling. — BALD, C. in *The Agricultural Journal of India*, Vol. VIII, Part. II, pp. 157-160. Calcutta, April 1913.

The plan of the experiments was as follows :

No. of plot & measure- ment half an acre)	Manure applied		
	1909	1910	1911
1	Castor meal, 14 maunds per acre	Castor meal, 4 maunds per acre. Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	id. id. Superphosphate, 60 lbs. per acre.
2	Mature leaves of <i>Cajanus indicus</i> .	id.	id.
3	Castor meal, 7½ maunds per acre	Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	Animal meal, 2 maunds per acre.
	Nothing (check plot).	Nothing (check plot).	Nothing (check plot).

The block of land which was selected for these experiments was as nearly equal in quality as it was possible to obtain, but the event proved that the quality of the check soil was the best.

A digest of the results for the three years in crop is as follows:

Tea per acre in	1909	1910	1911	Total
	lbs.	lbs.	lbs.	lbs.
Plot No. 1	247	265	345	857
» No. 2	239	313	324	876
» No. 3	258	270	312	840
» No. 4	275	305	286	866

With a view to determining whether there was any difference in quality of the teas produced under the different circumstances, samples of tea from all four plots were prepared and were valued on September 18, 1911. The valuations per lb. were $10\frac{1}{2}d$, $11d$, $9d$ and 1s respectively.

The cost of treatment works out as follows:

	1909	1910	1911	Total
	£ s d	£ s d	£ s d	£ s
Plot No. 1	4 5 4	2 4 6	2 19 6	9 9
» No. 2	— 6 1	— 6 1	— 6 1	— 18
» No. 3	2 2 8	1 1 10	1 1 2	4 5
» No. 4 check plot; no expenditure.				

The total crop from No. 4 is comparatively high. Apart from the valuation of the relative quality of the teas produced, the extra crop from it is not sufficient to pay for the treatment given it, while the cost of treatment to No. 1 is altogether prohibitive.

The valuation of the samples places No. 4, the untreated plot, higher than any of the others, while the green-manured plot comes second and the plot treated with animal manure is given a very low place. The valuations, however, cannot be regarded as final.

Some of the outstanding facts in connection with these experiments are the high cost of chemical and artificial manures in a remote district like Darjeeling, the extreme doubtfulness of their economic utility, above all the fact that green manuring is the cheapest method and at the same time produces remarkably satisfactory results.

Cultural Experiments with Medicinal Plants at Korneuburg in 1912. — TÄCHER, WILHELM. (Mitteilungen des Komitees zur staatlichen Förderung der Kultur der Arzneipflanzen in Oesterreich, No. 15) in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 8, pp. 833-848. Vienna, August 1913.

1. A comprehensive report of the cultivation of medicinal plants in Austria
 2. Detailed information respecting the sowing, development, management (in many cases manorial experiments), harvestings, yield, etc., of the following plants: hollyhock (*Althea rosea*), *Ancylus officinarum*, *Angelica archangelica*, *Anthemis nobilis*, marigold (*Calendula officinalis*), *Cnicus benedictus*, hemlock (*Conium maculatum*), thorn-apple (*Datura Stramonium*), poppy (*Papaver Rhoeas*), *Datura Tatula*, foxglove (*Digitalis purpurea*), *ma lutea*, *Grindelia robusta*, *Hyoscyamus agrestis*, henbane (*Hyoscyamus niger*), *Hydrastis canadensis*, hyssop (*Hyssopus officinalis*), *Mentha crispa*, *der* (*Lavandula spica*), *Levisticum officinale*, *Mentha canadensis* var. *ascens*, peppermint (*Mentha piperita*), *ine* (*Ruta graveolens*), sage (*Salvia officinalis*), *Spilanthes oleracea*, valerian (*Valeriana officinalis*), *Virbascum obovatum*.

Cultivation of Lavender in the South-East of France. — ROLLAND, M. in *Vie Agricole et rurale*, Year 2, No. 37, pp. 285-289. Paris, August 16, 1913.

economic position of essence of lavender. — For the last twelve years the price of essence of lavender has more than doubled, and has kept during several seasons at about 10s 9d per pound. This rise seems to be due to the discovery of a process which allows the economic extraction of this essence of some compounds used in the manufacture of perfume. On the other hand the yield of lavender plantations diminishes yearly and the work of reafforestation carried out by the Forest Administration reduces considerably the areas on which wild lavender grew.

Species of lavender. — They are numerous in France. But as the most noted French lavenders are those gathered on the subalpine chains: South-East, especially in the Departments of Drôme, Hautes-Alpes, Alpes, Vaucluse and Alpes-Maritimes, the writer only mentions the species of lavenders which are found in that region and which are interesting from a cultural point of view. The essence of lavender proper is supplied in two forms of *Lavandula vera* DC.: *Lavandula vera fragrans*, Jord. and *Lavandula vera delphinensis*. These are the only two small species which are to be multiplied and they are found most frequently associated in natural habitat. These two real lavenders are not found in the South at a height inferior to 1300 feet. Below this height they have yielded place to common lavender: *Lavandula spica* Chaix or *latifolia* Vill. lavender gives an essence of inferior quality, which is especially used for preparation of varnishes and costs usually only from 2s 10d to 3s 7d. In the belt where *Lavandula vera* and *L. spica* are neighbours, farmers have always found another species which they call "bastard lavender" and which yields a very inferior essence. M. Chatenier has analyzed this bastard lavender to be a hybrid of *L. v. fragrans* and *L. v. delphinensis* with *L. spica*.

Essence of lavender. — The essence is especially concentrated in flower, the peduncle containing only a very small quantity of it, harvesting, however, this peduncle is cut at a length of about 4 to 6 in. close to the first leaves. The composition of essence of lavender is comp. It owes its perfume to several bodies ; it contains also some compou which diminish its value to a varying degree according to the origin the amount of care bestowed upon the distillation. It is admitted t the fundamental element of the perfume is an ether of linalol, the ac of linalyle $\text{CH}_3\text{COOC}_{10}\text{H}_{18}$. The amount of this ether contained in real essences of lavender produced in the South-East of France is in s localities 40 to 42 per cent., while it sinks to 22 per cent. in less favour situations.

Influence of altitude, aspect and nature of the soil. — In the cultiv state the two real lavenders thrive and acquire enormous development on the sea coast, as is proved by some tests. The essences from pl gathered well below 1300 feet have commanded the same prices as th prepared from natural lavenders growing at medium heights. As seems to exert an influence on the quantity and quality of the essence duced, but its effect unites with that of altitude ; it remains to be obse in cultivations at lower elevations. As to soil, lavender seems not to very exacting.

Creation of a lavender field. — M. Cornillac has planted a lavender of 25 acres at about a mile from Valence. The soil is sandy with a deal of stones and gravel; the subsoil, which begins at a depth of 16 t inches, consists of big stones, gravel and building sand. The whole is a subject to drought and of a low value for farming. The land was plough to a depth of 16 inches and the lavender was planted, between November 15 and the end of February, in rows 46 inches apart, and the plants a inches in the rows. These were transplanted from an altitude of feet : almost all of them struck, less than 1 per cent. failing. The contains 105 000 plants, which cost delivered at the field 4s 4½ d hundred. The men were paid 2s 9d per day.

The cost of the whole field was :

	£	s	d
Ploughing ,	25	1	3
Purchase of plants	230	3	4
Compost and manure	11	17	11
Planting ,	41	2	4
Total . . . £	308	4	10

or £ 21 9s per acre.

It is especially to be noted that the young plants cut with the pr scissors, shoot forth again easily and that for this result it is of the gre importance to keep the field free from weeds during the first year.

Sometimes, in planting a new field, old stocks are used ; they are div into pieces and planted, but their striking is uncertain. Young pl

also be obtained by sowing in a nursery. M. Cornillac has most successfully tried this method. The subsequent cultivation consists in hoeing two or three times. The first year the flowers that appear are suppressed so as to exhaust the plants by allowing them to produce seed.

Lavender and truffle oaks. — The writer mentions several remarkable experiments on the growing of lavender in truffle producing oak plantations. *Regeneration of natural lavender fields.* — Many landowners have come to regenerate their natural lavender fields by ploughing them in a way as to leave only the plants in lines about 3 ft. 3 in. apart.

Artificial manures. — Experiments hitherto made allow the conclusion drawn that the use of artificials increases the quantity of flowers; the essence seems also to increase, and the quality of the perfume does not seem to be impaired.

Yield of a planted lavender field. — The writer, agreeing with M. Zacharie, states that an acre of lavender, planted in a favourable locality and treated with artificials, produces in ordinary years as follows :

1st year	Insignificant crop
2d »	1784 lbs. of flowers yielding 12.5 lbs. of essence
3d »	3122 " " 21.5 " "
4th and following years . . .	4460 " " 31.2 " "

Thus at the average price of 10s per lb. the gross returns of a lavender after its fourth year would be about £15 10s. The cost of gathering is more than $5\frac{1}{2}d$ per hundred pounds. The cost of distillation is about 1d per lb. of essence. The cost of hoeing and of manuring is about 2s per acre. All the expenses together are within £3 12s. Thus the returns are about £12 per acre.

Diseases of lavender. — The two most important, dodder and rot, are much to be feared.

- On an *Allium* from the Mediterranean Region which might be used as Vegetable. — TRABUT, L. in *Revue Horticole*, Year 85, No. 13, p. 311, 1 fig. Paris, July 1, 1913.

Allium triquetrum L. is well known along the Algerian coast, especially in neighbourhood of dwellings and in gardens, and is very much appreciated by the Berber population, who use it in large quantities during the winter. Culinary experiments of the writer have shown that the entire plant can be used to replace other vegetables in the winter months. Its leaves are tender when cooked and of good flavour.

The writer has also experimented with the cultivation of this onion; and it is necessary to plant the bulbs towards the end of summer at a depth of from 15 to 20 cm. (6 to 8 in.) in order to obtain a good substitute for onions. The bulbs planted separately and deeply in good soil produce plants in the winter, the portion below ground being blanched, very tender and appetising. With the green leaves removed they constitute an excellent vegetable free from all smell of garlic or leek and compatible

with any sauce. The writer has no hesitation in recommending this vegetable thus treated as a most interesting acquisition to gardens on the ^{very} _{best} of the Mediterranean.

1158 - **The Sexual Organs of Vine Hybrids.** — GARD, M. in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 157, No. 3, pp. 226-228, p. July 21, 1913.

I. In the cases of the male flowers (with long stamens) and the hermaphrodite flowers (with short recurved stamens), the pollen of the wild species is normal, the proportion of the empty grains not exceeding 10 to 15 per cent. In cultivated selected varieties, however, a large degeneration was noticed, the empty grains amounting to 50 per cent, and upward.

II. In the cultivated European vine two cases occur: 1) the pollen is often normal; 2) it consists of three kinds of grains: empty, normal and intermediate. According to the vine, sometimes the number of the two are equal, sometimes one or other predominates, but the full grains are generally the most numerous.

In the wild varieties, as in the cultivated, the cases where the pollen is normal are more numerous than those where it is degenerate. We have no information as regards the causes of this degeneration.

III. The pollen of double hybrids is always modified, though to a varying degree, in the case of males, hermaphrodites with long stamens and hermaphrodites with short stamens. Often grains occur which are small, deformed of abnormal appearance, not swelling in water, and with a very varied shape resembling in optical section (like those of some cultivated vine cap, a crescent, or a crown).

In three-quarter, triple and quadruple hybrids there are also considerable differences according to the hybrid examined; the proportion of empty grains may be nearly normal or very great. The quantity of pollen can present great variations.

The female organ, on the contrary, is as perfectly formed in hybrids as in species. The embryo-sac is never lacking in the ovules, and the are on the average more numerous than in the case of the parents.

IV. The pollen of short stamens, has, as is well known, very different morphological characters from that of the pollen of long stamens. From the cytological point of view, the writer has observed in the former a generative cell and a vegetative nucleus similar to that occurring in the latter, while the deformed grains which are nearly or quite empty in both cases lack a generative cell, or in any case the nucleus of the latter has degenerated.

Although not sterile as was supposed, the pollen of the short stamens is considered incapable of fertilizing the pistil of the same flower. The writer has proved the truth of this statement as regards *V. cordifolia*, *Jac d'Aurelles*, *Blue Favourite*, *Massassoit* and *Black Eagle*, while in the long-stamened flowers the pollen is fertile to the pistil of the same flower (1).

(1) See No. 1430, B. Oct. 1912.

V. The facts presented by the sexual organs of vine hybrids are thus in exception to those already known, and do not agree with the statement of M. Couderc. The male elements are altered to a more or less considerable extent, while the female organs remain intact, according to the fact that ovules which occur in small numbers undergo no degeneration. Mr. Booth has described two distinct forms of pollen, the one fertile and the other infertile, independently of the length and habit of the vines, and which may occur together in certain American vines. They doubtless correspond to the normal and altered grains of hybrids and of original vines. Their occurrence in the varieties studied by the writer is a surprising matter, seeing that the former are natural hybrids, though this fact is denied by a certain American school which is under the influence of Engelmann's ideas.

- The Reconstitution of Swiss Vineyards. — FABs, II. in *Revue de Viticulture*, year 20, Vol. XI, No. 1026, pp. 210-213. Paris, August 14, 1913.

In the spring of 1912, the Canton Vaud used in the reconstitution of vineyards 1 371 250 meters (1) of "grafting wood", of which 194 150 m. were furnished by the Cantonal nurseries. The following were the varieties in demand: Riparia \times Rupestris 3 309 (625 300 m.), Riparia \times estris 101¹⁴ (300 400 m.), Riparia \times Rupestris 3 306 (137 750 m.), rvedre \times Rupestris 1202 (99 500 m.), Berlandieri \times Riparia 420 A (50 m.). The vintage of 1911, which was good on the whole, influenced the grafting of the spring of 1912 and gave rise to a greater demand of grafting wood (1 096 985 m. in the spring of 1911). A "grafting department" was carried on as usual at the Champs-de-l'Air Vine-growing Station. In considering the vineyards in Switzerland which have been reconstituted on American stocks, it is possible, taking them as a whole, to arrive at certain conclusions; though these may not be final, they are sufficiently satisfactory to permit of the work of reconstitution being continued with a fair amount of security.

At the beginning of the reconstitution operations, Riparia Gloire de l'epier and Rupestris were used amongst other "pure American stocks" in certain number of vineyards. Subsequently, Americo \times American Franco \times American stocks have been substituted for those first planted and now tend to entirely replace them.

In the Canton of Geneva, it is found that Riparia Gloire, when planted in a good situation on deep, damp, slightly calcareous soil produces regular good crops. It has, however, the defect of sometimes losing its vigour, after four or five crops, if it is planted in less fertile, although deep soil. It is thought that the hybrids give better promise, especially as regards this.

At Neuchâtel, Riparia Gloire has proved to be prolific and has grown a fine plant on certain rich, deep soils poor in lime. But these special

(1) One meter = about 3 ft. 3 in.

soils are very rare in the district, where most of the soil is dry and shallow. Riparia, also, has never been a favourite in this Canton.

In Ticino, Rupestris is being given up, as its wood ripens badly, especially in cold, wet seasons. It is also believed to have been observed that during severe winters, plants grafted on Rupestris suffer from frost more than do other vines. With regard to Riparia, the latter stock gave the best results in the southern part of the Canton, where the reconstitution was begun on the best soils of the district. Disappointment, however, followed in the Lugano neighbourhood, where the soil of the vineyards is more stony. It is recorded that here also Riparia is abnormally productive at first, but soon perishes, all the more owing to the long pruning adopted in order to obtain a larger crop.

In the Canton Vaud certain soils have been found to be perfectly suitable to either Riparia or Rupestris. But in consequence of the strict pruning practised in the Swiss vineyards, this latter stock tends frequently to promote the vegetative growth of its scion at the expense of the vine, which causes the grapes to ripen late. Riparia Gloire has proved especially unsatisfactory on a heavy, cold type of soil, such as that often present in glacial clays, irrespective of the amount of lime present.

Americo \times American stocks, and especially Riparia \times Rupestris, are being increasingly substituted for pure American stocks, owing to their greater powers of adaptation. Riparia \times Rupestris 3 309, 101¹⁴, 3¹ and 11-F form at the present time the basis of reconstitution in most of the Swiss vineyards with poor or average soil; of these the two former are by far the most common. So far, the said stocks have given satisfaction in the majority of cases. Solonis \times Riparia 1 616, a hybrid much in demand only a few years ago, is now out of favour, as it is considered, perhaps wrongly, to possess insufficient power of phylloxera resistance. In the Canton Vaud, for instance, Riparia \times Rupestris 101¹⁴, which has already been planted in numerous vineyards, is without doubt a stock suitable for many average, rather heavy, and even heavy soils. It should not be planted in very light dry soils, or in those wanting in depth, for it is easily affected by drought. It nearly always prefers somewhat heavy soils to very light ones. This vine must not be grown in tufaceous soil, or in calcareous marls, as its resistance to calcium carbonate is not sufficient to allow of its normal development in soils of this nature.

In the same district, Riparia \times Rupestris 3 309 gives excellent results on a large variety of soils, and replaces the Lot variety on gravelly and stony soils. The writer has often seen magnificent specimens of this vine, covered with fruit, growing on the gravelly soil of the Aigle district. On the other hand, 3 309 having been quite recently introduced into Switzerland, plantations on this stock are, as a rule, younger than those grafted on 101¹⁴. When their progress has been followed for a few more years, it will be possible to decide authoritatively upon the type of soil best fitted for this vine, which is much in request now-a-days.

The Canton of Neuchâtel has proved especially suitable to Riparia \times Rupestris 3 309.

in the Canton Ticino, *Riparia* × *Rupestris* 101¹⁴ has gained the *ix* of the vine grower. Its adaptability to vineyard soils of different *ositions* in that district is relatively great; its growth leaves nothing *esired*, and its fruit-bearing property is well developed. *Riparia* × *stris* 3309, which has recently been introduced, especially on dry *oils*, appears so far to be suitable also to the Ticino vineyards.

As regards the Franco-American stocks, *Aramon* × *Rupestris* 1 and *vedre* × *Rupestris* 1202 have been planted, but very few *Chasselas* × *ndieri* 41-B. Franco-Americans have especially been used on *act* calcareous soils, even when damp, where other stocks would not *ad*. At Arnex-sur-Oïbe, in the Vaud vine district, there are very stiff *teous* marls containing a uniform amount of from 40 to 60 per cent, *ry* fine carbonate of lime. The whole series of *Riparia* × *Rupestris*, *is* × *Riparia* 1616, the pure Americans, *Riparia* *Gloire* and *Rupestris* *ot* perish very quickly on such soils. Only *Aramon* × *Rupestris* 1, *specially* *Mourvèdre* × *Rupestris* 1202, which is still more chlorosis-*ant*, have given results which can be called favourable. It is also *ting* to observe that hitherto in the Arnex vineyards, which are much *ted* with *phyloxera*, where this insect has done great damage since *the* above-mentioned Franco-American stocks proved sufficiently *phylo*-resistant, while the young vines of the country which had been *ed* along side by persons hostile to the new methods, succumbed *in* a few years to the persistent attacks of the insect.

In general, however, the present tendency in Switzerland is to reduce *number* of Franco × American stocks used, as the reproaches levelled *st* the vines grafted on *Rupestris* du *Lot* are still more merited in *the* of grafts upon *Aramon* × *Rupestris* and *Mourvèdre* × *Rupestris* 1202. *the* stocks have often a marked inclination to over-stimulate the vegeta-*growth* of their scions; they run too much to wood. Some long me-*ns* of pruning occasionally remedy this defect, but produce large crops *h* are liable not to ripen well, especially in cold seasons. A delay in *ing* is nearly always noticeable, under Swiss climatic conditions, *in* grafted on *Mourvèdre* × *Rupestris* 1202 or *Aramon* × *Rupestris* 1. *the* fact would not be of much importance if it were only a question of *quantity* of the grapes, but the Swiss vine-growers are very tenacious *aintaining* the *quality* of their local wines.

At the present time, many experiments are being made as to the *possi*-*ty* of substituting, especially in the case of choice vineyards, *Berlandieri* *ids* for the above-mentioned Franco × American stocks. *Riparia* × *ndieri* 420-A, and 157 157¹¹ have been most used; 34 E M and *Chasselas* *Berlandieri* 41-B appeared weaker. There still remain to be tried the *ks* of the Hungarian *Riparia* × *Berlandieri* *Teleki* series, of which some *is* worthy of experiment.

Owing to the fact that the *Berlandieri* variety was accustomed to a hot *limate*, the preconceived idea still prevailed only a few years ago that *the* hybrids of this vine would not succeed in Switzerland. But in the *emmental* vineyards, the *Berlandieri* hybrids now bearing produce a

crop which is relatively satisfactory, both as regards quantity and quality even when growing in fairly northern situations, such as the Bernese district on the shore of the Lake of Biel. No doubt, during the first few years, the vines which have been grafted on these stocks do not develop as vigorously as their neighbours grafted on *Riparia* \times *Rupestris* or *Aram* \times *Rupestris* 1 and *Mourvèdre* \times *Rupestris* 1202, but they quickly make up for lost time and begin to bear. Vineyards which have been replanted with *Berlandieri* hybrids deserve to be studied and closely observed, on the other hand they are not sufficiently numerous to allow of any comprehensive opinion being formed upon their value in the general reconstitution of the vineyards of Switzerland.

1160 — *Manuring of Coconuts in the Seychelles.* — RIVALTZ DUPONT, *Contribution à l'étude du Cocotier aux Seychelles. — L'Agriculture pratiquée des pays chauds*, Vol. No. 122, pp. 345-355. Paris, May 1913.

The quantity of mineral matter removed from the soil by the coconut is considerable when the fibre and leaves are not returned. The copra itself represents a very small proportion, only about one-fifth of this quantity. It is therefore desirable to utilise the leaves and other residues before considering other manures. The writer has studied the coconut fertilisers on the two types of soil in the Seychelles.

1) *Madreporic soils.* — They occur in the outlying islands, which are extremely fertile owing to deposits of guano having the following composition.

Moisture	7.20
Organic matter	12.50
Lime.	44.30
Magnesia	1.70
Potash	0.38
Phosphoric acid.	30.85
Sulphuric acid	0.69
Silica.	2.06
Iron, alumina, etc.	0.36
	100.04

There is a deficiency of potash, but according to Boname the coconut utilises considerable quantities of sodium salts during the growth of the florescence, and it appears that less potash is consumed and the two bases are interchangeable in the requirements of this plant.

2. *Granitic soils.* — These soils require neutralising with lime or guano. Potash is generally deficient in soils that have been cultivated for a long time. Phosphoric acid is supplied economically by the guano, which costs only 16 to 24 s per ton at Victoria.

Potash manures. — Sulphate of potash should be preferred, as the cost of potash in it (at Bombay or Colombo) costs only 4s 9d, as compared with 7s in kainit. The writer recommends the application of 45 to 90 lbs. per acre buried in trenches round the trees.

Nitrogenous manures. — The writer recommends green manures (*Tephrosia candida*, etc), seaweed and farmyard manure where possible. An excellent manure for coconuts could be obtained by the organisation of fisher-

- **The Forests of Taiwan (Formosa).** — THE GOVERNMENT GENERAL OF TAIWAN, Statistical Summary of Taiwan, pp. 21-24, 429-430. Tokyo, 1912.

The Island of Taiwan is rich in forests and in unclaimed lands on borders of those forests. Its total area, including the beds of rivers, 888 sq. miles.

General Conditions of Forests. — The forests of Taiwan comprise, to the high altitudes of some of the mountains and to great extremes in meteorological conditions, all kinds of vegetation belonging to tropical, subtropical, temperate and even to subalpine climates. The part of the island that is in the civilized part of the island had under the Chinese rule been to a great extent cleared of trees. Of late years, however, reforestation has been urged and a great improvement is already noticeable. The lands in the frontiers of the savage tribes are nearly all covered with natural forests in which abound « obtuse ground cypresses » (*Chamaecyparis obtusa* Sieb. et Zucc.), camphor-trees and « pointed oak » (*Quercus* *ta*).

Preservation forests. — The utilization of forests in Taiwan is still in its infancy. As for the official exploitation of forests, the camphor trade is the only enterprise worth mentioning. Nevertheless the indiscriminate felling of trees for purposes of reclamation has caused grave fears as to the proper caring for the river courses. It follows that while it is desirable to secure increased exploitation of forests, it is important to set aside certain preservation forests in the catchment basins. The Governor-General is therefore establishing such forests. Their area amounts to 59 092 acres.

Use or sale of government forests or wild lands. — The largest number of transactions formerly took place under the Regulations for the Provincial Sale of Forests and Wild Lands, the total area disposed of in this way to the close of 1910 amounting to 134 750 acres. Next in area come those dealt with according to the Regulation for the Encouragement of the Cultivation of Camphor Trees. In 1911, however, more forests and wild lands were sold under the latter regulations than under the former. The area of forest and waste land sold and leased from the beginning up to the end of 1911 amounted to about 310 660 acres.

Forestation and nurseries. — The Government is not only conducting station on its own account, but is giving encouragement to private individuals to engage in the same work. The trees thus planted consist of camphor, *Acacia confusa*, Merril, pines, cryptomerias and other needle-leaved and broad-leaved trees. At the close of 1911 the total afforested area was about 39 200 acres.

Forestry Experiment Stations. — Owing to the special nature of vegetation in the island, the Industrial Section of the Department of Civil Affairs established in May 1911 the Forestry Experiment Station at Tainan with two branch stations. According to its regulations the station is to carry out the following work :
1. Investigation and introduction of useful plants both from Japan and other countries.

2. Investigations and experiments connected with afforestation, as, as the exploitation and preservation of forests.

3. Improvement of seedlings and their distribution.

Training of forestry experts. — The primitive state of the forest industry in Taiwan induced the Government in 1908 to commence training men for the work, so that every year fifteen experts may be supplied to the Local Government and to private parties.

In 1910 Rules for Investigating Forests and Wild Lands were issued according to which the surveys and investigations of forests are to be actively carried out.

Arisan forests. — These famous forests, which are being exploited by the Government of Taiwan, are situated within the savage land limits and comprise a total area of 26,950 acres containing timber estimated at 200 million cubic feet. The forests are found at altitudes ranging between 2800 feet and 8700 feet above sea-level and are reached by a forest railway 41 miles long, from the main line. The exploitation of these forests originally started as a private undertaking but was transferred to Government through purchase in 1910. In the lower parts of the forest are found camphor-trees, oak, *Alnus maritima* Nutt. var. *Formosana* Burkitt, *Machilus Thunbergii* S. and Z. and *Quercus cuspis* Thunb. which are broad-leaved; in the upper portions occur the conifers: *maeacyparis Formosensis* Mats., *Ch. obtusa* S. and Z. form *Formosana* mixed with cedars, *Pinus Formosana* Hay, *Tsuga Sieboldii* Car. The Government has adopted the plan of entirely renovating the Arisan forest in thirty five-years by felling certain portions each year and reforesting them afterwards. According to this plan the average felling each year will amount to 3 million cub. ft. of conifers and 1,200,000 cub. ft. of broad-leaved trees. A railway and a sawmill will be built, and nurseries have been laid out on 17 acres.

Camphor industry. — As has already been stated the principal organization of the forests of Taiwan has been by the extraction of camphor organized as a State monopoly. The Island's Monopoly Bureau exported 7,236,810 lbs. of camphor abroad and 1,137,780 lbs. to the refiners in Japan together valued at about £ 489,300.

It is undoubtedly that the camphor industry has suffered more or less as the operations for the better control of aborigines progressed; but the output of the year did not fall short of the estimates, the figures being 9,671 lbs. of crude camphor and 7,019,896 lbs. of camphor oil. Of these the amounts received by the Monopoly Bureau were: crude camphor 6,071 lbs. and camphor oil 7,514,489 lbs., which were less than the receipts for the previous year by 1,425,622 lbs. crude camphor and 1,019,732 lbs. of camphor oil. Up to 1911 the work of distillation was conducted entirely by private firms under contract with the Monopoly Bureau; but as there was a great deal of unnecessary waste and inferior quality of product the Monopoly Bureau began experiments in distilling camphor oil and in 1911 satisfactory distillation arrangements were completed. But as the plant is not large enough, a part of the work is still leased out to private firms as former

- **Experiments on the Influence of Manures in Nurseries.** — CUIF, E. Research Station of the National School of Waters and Forests), in *Annales de la Science Agronomique*, Year 30, No. 6, pp. 433-454. Paris, June 1913.

The experiments of Bartet were taken up again on a new system in 1906. This article describes the method of experimentation followed and gives results of some of the earlier experiments.

LIVE STOCK AND BREEDING.

- **The Cause of Fagopyrism. A Contribution to the Study of the Fluorescent Colouring Matters in the Seedcoat of Buckwheat.** — FESSLER, KURT in *Berliner Tierärztliche Wochenschrift*, Year 29, No. 28, pp. 497-499. Berlin, July 10, 1913.

After making analytical and spectroscopical investigations respecting colouring matters of the seedcoat of buckwheat, the writer is of opinion fagopyrism is caused by the crude chlorophyll.

- **On Four New Species and Two New Varieties of the Ixodid Genus *Haemaphysalis*.** — WARBURTON, CECIL in *Parasitology*, Vol. VI, No. 2, pp. 121-130. London, July 1913.

In his short introduction, the writer mentions that the examination of a number of ticks collected in late years from various hosts in many parts of the world, has resulted in the addition of several new species to the genus *Haemaphysalis*; the number of recognised species in this genus now reaches 43.

Just as *Rhipicephalus* is proper to Africa, so *Haemaphysalis* is essentially Asiatic, and the Indian region has furnished most of the newly described forms. One of the species described by the writer is African, the remainder being additions to the Indian fauna. The difficulties presented by the genus *Haemaphysalis* are chiefly due to the fact that its characters are negative; the writer, however, states that there is no lack of definitely defined forms and gives a diagnosis.

Detailed descriptions follow of the new varieties and species mentioned.

Haemaphysalis aborensis (Yambung, India), *H. howletti* (Rawalpindi, India), *H. aciculifer* (Uganda), *H. kinneari* (Kanara, India), *H. cornigera* var. *nala* (India), *H. inermis* var. *aponommoides* (Belgachia, Calcutta). Eight figures illustrate the text.

- **New Species of *Ixodes*.** — NUTTALL, G. H. F. Notes on Ticks. III: On Four New Species of *Ixodes*. — *Parasitology*, Vol. VI, No. 2, pp. 131-138. London, July 1913. The new species described in this paper are of interest, although the writer is only able to deal with females, as is frequently the case with this genus. The species (*I. kempfi*), allied to the North American *I. angusta*, comes from a hitherto unexplored region on the north-east frontier of India, having been collected by the Abor Expedition. Two species, *I. daveyi* and *I. oldi*, are from Africa, and offer a peculiarity of structure in that they possess anal

grooves having the form of a horse-shoe, an appearance only hitherto served in three other species of *Ixodes*, all of which are African. The fourth species, *I. ricinoides*, is from China and is allied to *I. ricinus*.

The writer gives a description of the following species: *Ixodes ka* (Kobo, Abor Country), *I. daveyi* (Rusvenzori, Uganda), *I. oldi* (Komata, Sierra Leone), *I. ricinoides* (Wen-chwan-hsien, China).

This article is illustrated by four text-figures.

1166 — **The Distribution of Creatin in the Bodies of Mammals.** — BERER, J. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vol. 87, Part 1, pp. 1-2, Strasburg, August 16, 1913.

A communication giving the results of numerous analyses made to ascertain the creatin and creatinin content of the organs of cow, goat, rabbit and dog. It was found that the largest amount of creatinin (31.7 mgm. per 100 gm. of organic substance) was present in the voluntary muscle and the least (9.76 mgm.) in the thymus gland. In 100 c. c. of blood, 1 to 2.17 mgm. of creatin was found. In the foetal condition, mammals have little of this substance, though much is present after birth. In animals in advanced pregnancy, the absolute and relative creatinin content increases. The right horn of the uterus of pregnant animals contains more creatinin than the left. The liver dehydrates creatin to creatinin.

1167 — **A Calorimeter for Small Animals.** — TANGL, F. in *Biochemische Zeitschrift*, Vol. 53, Part 1-2, pp. 21-35. Berlin, July 15, 1913.

This calorimeter is constructed on the same principle as Bohr and Heschelbach's calorimeter devised for the determination of the heat production of the chicken embryo.

The heat production is thermo-electrically measured: the thermo-electric current produced by the increase of temperature determined by the production of the animal heat is measured by comparing it with the amount of heat derived from another source which produces an electric current of exactly the same strength (compensation). The calorimeter in question (of which the construction, working and management are minutely described by the writer, and of which he gives three diagrams), differs from the Bohr-Heschelbach apparatus in the method adopted for the thermic isolation of the chambers containing the small animals, the isolation being made more complete by the use of Dewar flasks. The fact that the animals move during the experiment was taken into account in the method adopted. Rats, mice, frogs and leeches were used for the experiments. The duration was 10 to 24 hours, allowing 1 to 1 1/2 hour to obtain the most exact compensation, there remaining 8 to 22 hours for the estimation of the heat production. The weight of the body and all its excretions can be calculated to one-hundredth of a gram. The writer will communicate the results of the first experiment in a number of the *Biochemische Zeitschrift*.

The Effect of Previous Nutrition upon Metabolism during Fasting. — KLOESMANN, ARTHUR and MÜRSCHAUER, HANS in *Biochemische Zeitschrift*, Vol. 53, Art 4-5, pp. 265-299. Berlin, July 27, 1913.

On the conclusion of experiments on the interchange of gases in fasting rats, the writers made further investigations at the Akademische Klinik in Dusseidorf, in order to ascertain whether, and how far, a diet confined to one substance affected gaseous interchange in a hungry animal. The animals used for the experiment were first starved until they lost half of their weight, which was after the lapse of 16 days; their gaseous change (absorption of O_2 and production of CO_2) was then determined. Then the dogs were fed up to their original weight, after which followed another fasting period of 24 hours concluded by a respiration experiment.

After the animals had taken food for the second time (for some time their gaseous exchange was investigated for a third time at the end of another fasting period of 24 hours. The food given during the experiment was fat in the case of dog I, carbohydrate in that of dog II, and in in that of dog III.

A second experiment was undertaken by the writers for the purpose of finding in what manner metabolism took place in a dog when deprived of food for some length of time. To this end, the three dogs were deprived of food, and after fasting for 24, 2×24 , 4×24 , 7×24 , 8×24 , 12×24 , and 24 hours, the metabolic changes were investigated.

It was found from these two experiments that the respiration quotient (production of CO_2 per unit of O_2 absorption) depends, in the case of a fasting animal, upon the substance which have previously taken part in building up its body. The effect of one kind upon gaseous interchange during fasting is thus discernible even after the direct effect of the last meal has long passed away. In the case of animals which have been deprived of food, anabolism is effected in a manner corresponding to the combustion processes of the previous diet. Through being fed upon a single substance, such as glycogen or fat, the body accustoms itself to consume more or less glycogen, or more or less fat. In animals accustomed to an exclusive fat diet, the respiratory quotient, even when they are fasting, is nearly the theoretical fat quotient; in an exclusive carbohydrate diet, the quotient approaches the theoretical carbohydrate quotient. In the case of long and continuous fasting, the effect on metabolism produced by a previous fat diet lasts longer than that of a carbohydrate diet, because the glycogen supply, when much upon, is more quickly consumed than the fat supply.

By means of their diet, it is thus possible to exert a direct effect upon respiratory metabolism, and one which outlasts the feeding period and prepares the organisms for the task of breaking up larger amounts of fat or glycogen.

1169 - The Influence of the Ingestion of Sodium Nitrate on Nitrogen Exchange

GRAFE, E. and WINTZ, H. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vol. 76, Part 4, pp. 283-414. Strasburg, July 21, 1913.

The writers summarize the results of the experiments of Barth, Röhl, Binz, Gerlinger, Gérard, Oppenheimer, Harnack and others upon the effect of sodium nitrate upon animal organisms.

They also give a description of their latest experiments made on a dog and three pigs, with the object of studying the action of sodium nitrate in decreasing the amount of nitrogen eliminated by the organism. They follow like Ahderhalden and Hirsch, that sodium nitrate acts in four ways:

1. There is no change in the nitrogen exchange; the nitrate is again eliminated quantitatively.

2. The nitrate is eliminated quantitatively, but produces a great reduction in the loss of Kjeldahl nitrogen.

3. From 10 to 15 per cent. of the nitrate nitrogen ingested is retained in a stable form and remains in the body. At the same time, the Kjeldahl nitrogen exchange may, or may not, be modified in a favourable manner.

4. Strong doses of nitrate increase the elimination of Kjeldahl nitrogen.

The differences in the experimental results seem principally due to the amount of nitrogen administered.

1170 - The Effect of the Iron Content of Blood Meal upon the Iron Assimilation of Animals fed with It. — GROH, JULIUS in *Biochemische Zeitschrift*, Vol. 33, pp. 256-258. Berlin, July 18, 1913.

The writer used as the subjects of these experiments two Yorkshire pigs weighing respectively 174 lbs. and 139 lbs. The experiment was divided into two periods, during one of which maize was fed, and during the other maize and blood meal. During the first period, which lasted 18 days in the case of pig I, and 8 days in that of pig II, the former received daily 4.2 lbs. of crushed maize, and the latter 3.3 lbs. The second period was prolonged in the case of both animals by a preliminary feeding period of 21 days which itself lasted for 10 days. During this time, the daily rations were 2.8 lbs. of crushed maize, and 0.44 lbs. of blood meal per animal. The iron content of the food and excrement were determined gravimetrically. The accompanying table gives the results of the experiment:

I. — Maize period.

	Pig I — gm.	Pig II — gm.
Iron ingested daily with the maize	0.425	0.32
Iron eliminated daily in the faeces	0.451	0.30
" " " " urine	traces	trace
Balance of iron	—0.026	+0.01

II. — *Maize and blood meal period.*

	Pig I	Pig II
	gr.	gr.
ingested daily with the maize	0.283	0.283
" " " " " blood meal	1.206	1.206
eliminated daily in the faeces	1.483	1.509
" " " " " urine	traces	traces
Balance of iron	+ 0.006	- 0.020

thus, in spite of the large amount of iron ingested, the animals did not take an increased quantity of this substance.

The Relation of Growth to the Chemical Constituents of the Diet. — BORNS, T. B. and MENDLER, L. B. in *The Journal of Biological Chemistry*, Vol. XV, No. 2, pp. 311-320. Baltimore, Md., August 1913.

A number of charts are given showing the results of further experiments on feeding of rats on variously prepared foods. In conformity with the results obtained previously, both by the writers and other investigators, a milk food (in the form of a paste consisting of 60 per cent. of milk fat, 12 per cent. of starch and 28 per cent. of lard) diet was capable of supporting rats with the necessary elements for both perfect growth and maintenance, the specially prepared "natural protein-free milk", or artificial rations from pure chemical substances made to imitate closely the composition of the "protein-free milk", though capable of supplying the elements needed for maintenance failed to produce perfect growth. Young rats fed these diets developed normally up to a certain point, and then sooner or later succumbed, but recovery always took place if milk food was added to the rations.

While all the available evidence makes it extremely improbable that the difference in the relative efficiency of these foods is due to the proteins, carbohydrates and inorganic elements are essentially alike in all, and all have been subjected to the same amount of heating. But the inefficient rations lack those components of milk which are separated in the centrifuge or removed by filtration (cream and any cellular elements) during the preparation of the "protein-free milk". In order to investigate the influence of either of these factors, unsalted butter was added to the diet of rats on "natural" and "artificial protein-free milk". This proved to have the same restoring effect as the milk food, and experiments are now conducted to investigate the matter more thoroughly.

Sorghum Crops for Silage. Feeding Experiments with Dairy Cattle. — BORNS, T. B. and FIRCH, J. B. — *Kansas State Agricultural College, Experiment Station Circular* No. 28, pp. 6. Kansas, 1913.

Sorghum crops, both saccharine and non-saccharine, can be used for silage with good results. The corn plant has considerable prestige as a silage crop, and has been more generally used for this purpose in Kansas than any other. As in most parts of Kansas the yield of sorghums, such as kafir sweet sorghum, is considerably larger than that of corn (maize), it was thought that if these crops could be made into silage, they would be of par-

TABLE I.
LOT. I. — *Four cows. — Twenty-day periods.*

Period	Milk	Butter fat	kg. per cwt.
	Ibs.	Ibs.	Ibs.
1. Corn silage in ration	1 337	55	42
2. Cane silage in ration	1 252	51	41
3. Corn silage in ration	1 178	49	40
Average. — 1st and 3rd periods corn silage.	1 257	52	41
2nd period cane silage.	1 252	51	41
Difference	5	1	1

LOT. II. — *Four cows. — Twenty-day periods.*

1. Cane silage in ration	1 192	54	40
2. Corn silage in ration	1 167	51	39
3. Cane silage in ration	989	46	40
Average. — 1st and 3rd periods cane silage	1 091	51	40
2nd period corn silage	1 167	51	39
Difference.	76	—	—

ticular advantage to the farmers and stockmen of the western district as corn is grown with much difficulty and uncertainty. Therefore, two years ago, the Dairy Department of the Kansas Agricultural College planned an experiment to determine the value of sorghums for silage.

The first sorghum crop put into the silo was sweet sorghum, commonly called cane. If the cane is put into the silo three weeks after corn silage, it is found that the former does not contain as much acidity as silage. The cane used in this experiment was grown on upland soil on the College farm, and the sorghum crop was larger than the maize crop, which occupied part of the same field.

In the following year 1912, one silo was filled with cane, one with corn, and one with corn; here again the same results were obtained with the cane as before. It made a good quality of silage containing less acid than corn silage.

1911-1912 the first feeding experiment was made with milch cows, age being compared with corn silage. Two lots of four cows each were used for the experiment.

Lot I were fed for the first twenty days on corn silage. For the second 5 (after an interval of 10 days), they were fed on cane silage. After an intervening period of 10 days the third twenty-day period began, when they were again fed on corn silage. The animals in lot II were fed cane during the first period, corn silage during the second period and cane during the third period. It was planned to get a direct comparison of the two feeds by comparing in each case the average of the first and third periods with the second period. Cows gradually decline in milk yield, and the production of the first and third periods would naturally be about equal to the production of the second period. These cows were fed a grain hay ration in addition to the silage; the hay ration was kept constant, a grain ration was fed in proportion to the amount of milk produced, remained practically constant. The only change, then, in the ration of the experiment was the change made from one kind of silage to the other. The table on the opposite page gives the results of the experiment. Studying the table of results on lot I, we find an increase in live weight during the cane silage feeding period; this increase is also observed on averages of the first and third periods, while the increase in milk and fat production during the corn silage feeding is so small as to be negligible.

Lot II gave similar results. The corn silage produced more milk and fat than the cane silage, while the cane silage caused gains in live weight. Averages of the whole experiment suggest that cane silage is more fattening than corn silage.

During the winter of 1912-1913 a feeding experiment was conducted with fifteen dairy cows, in which comparison was made of the respective values of three crops for silage: kafir, cane and corn. The general plan of the experiment was similar to that of the preceding year. Fifteen cows were divided into three lots. Lot I contained six cows which were used to compare cane with corn silage, lot II consisted of five cows fed on cane and kafir while in lot III four cows were used to determine the comparative values of corn silage and cane silage. The cattle in each lot were fed for three periods of 30 days each with a ten-day period intervening between the first and second periods, and also between the second and third periods. The experiment included only the 30 days in each period. Table II gives the results of the second trial.

The results of the experiments in Lot I indicate that corn silage is superior to kafir silage for milk production, while kafir silage proved more fattening.

In the second lot, kafir silage proved much better than cane for milk production. The cows made a very slight gain in body weight while on the kafir silage.

In the third lot, corn proved superior to cane silage. The former fed a larger milk yield and a very slight gain in live weight.

TABLE II.

LOT I. — *Kafir Silage versus Corn Silage.*
(Six Cows — Thirty-day periods).

Period	Milk	Butter fat	Body fat
	lbs.	lbs.	lb.
1. Kafir silage in ration	3 373	142	60
2. Corn silage in ration	3 383	140	58
3. Kafir silage in ration	3 339	139	62
Average 1st and 3rd periods, kafir silage	3 356	140	60
2nd period, corn silage	3 383	140	59
Difference	27	—	

LOT II. — *Cane Silage versus Kafir Silage.*
(Five cows — Thirty-day periods).

1. Cane silage in ration	2 384	107	4
2. Kafir silage in ration	2 492	112	4
3. Cane silage in ration	2 139	98	4
Average 1st and 3rd periods, cane silage	2 261	102	4
2nd period, kafir silage	2 492	112	4
Difference	231	10	

LOT III. — *Corn Silage versus Cane Silage.*
(Four Cows — Thirty-day periods).

1. Corn silage in ration	1 953	89	3
2. Cane silage in ration	1 832	86	3
3. Corn silage in ration	1 852	85	3
Average 1st and 2nd periods, corn silage	1 902	87	3
2nd period, cane silage	1 832	86	3
Difference	70	1	

summing up the work of both trials, the following conclusions may be drawn.

1. Corn silage is slightly superior as a milk producer to silage made from kafir or cane.

2. Kafir silage ranks second as a feed for milk cows.

3. Cane silage ranks third as a milk producer.

In both trials the cattle gained in live weight on cane silage more readily than on silage made from kafir or corn. This fact would indicate that the cane contains more carbohydrates and sugar, or fattening substances, than other feeds. In the writers' opinion, cane silage would prove the best of corn or kafir silage if more protein and less fat-forming nutrients were added in the grain ration, so that the animal could use the nutrients more effectively.

Although kafir and cane silage were shown by the experiments to be less valuable than corn silage, there are other factors that must be considered; namely yield and adaptability to local conditions. Without the greater yield of cane and kafir to the acre will offset the slight loss in feeding value to be obtained from corn silage. Kafir and cane are both resisting crops, they can be grown over a wider territory than corn and yield from one-third to one-half more tonnage to the acre.

During both trials the acidity of the cane silage was never more than that of corn silage. In the second trial the average acidity for the three different kinds of silage was as follows: corn, 2.03 per cent.; cane, 1.46 per cent.; kafir, 1.43 per cent.

It was also noted during the experiment that most of the cane seed and a large amount of the kafir seed passed through the animals undigested, which suggests that the nutritive value of these crops as silage is limited to the stalks and leaves. The quality of silage obtained from all three crops was very good. The kafir silage was perhaps the poorest on account of its immaturity. The cows eat the silage with relish, and appeared to prefer cane silage.

The silage was stored in wooden-stave and in cement silos, and kept very well in either case. The time of cutting cane and kafir is all-important in making good silage from these crops. They should be practically ripe; that is the seed should be ripe. If cut too green the silage is not good.

After a heavy frost, the crop should be cut and siloed immediately. If it dries out too much, sufficient water should be added to enable it to keep well.

- Manioc Roots and the Residues of their Elaboration. — KLING, M. in *die Landwirtschaftlichen Versuchsstationen*, Vol. 82, Part 3-4, pp. 211-233. Berlin, May 17, 1913.

From the roots of the manioc (*Manihot utilissima* Pohl) two kinds of flour are obtained, one of which is used as an article of diet, while the other is the starch (*Appreturmittel*) of commerce. Recently, the residues of the starch industry have also made their appearance on the market, especially in the form of cattle feeds.

TABLE I. — Composition of dried manioc roots.

Constituents	Fresh material	Dried material
	per cent.	per cent.
Moisture	11.28	—
Crude protein	13.35	1.32
Crude fat	0.27	0.30
N-free extract	83.27	93.86
Crude fibre	1.98	2.23
Ash.	1.85	2.09

TABLE II. — *Composition of the starch made by Messrs. Zwick & Son of Neustadt.*

Constituents	Fresh material	Dried material
	per cent.	per cent.
Moisture	10.85	—
Crude protein	1.53	1.72
Crude fat	0.38	0.42
N-free extract	83.68	93.85
Crude fibre	1.55	1.74
Ash	2.01	2.26

Manioc is cultivated in the Malay Peninsula, in Africa, in South America, and especially in Java.

The residues of the Javan tapioca, called "tapioca ampas", find their way, like tapioca itself, to the European markets. The tapioca exported from Java in 1907 amounted to 21,000 tons, and in 1907 to 44,000 tons.

TABLE III. — Composition of the « Stärkefuttermehl »
of Messrs. Zwick and Sons of Neustadt.

Constituents	Fresh material per cent.	Dried material per cent.
ure	10.93	—
protein	3.59	4.03
fat	0.74	0.84
extract	75.95	85.27
fibre	6.10	6.84
.....	2.69	3.02

TABLE IV. — Composition of the « Stärkeschlempe »
of Messrs. Zwick and Sons of Neustadt.

Constituents	Fresh material per cent.	Dried material per cent.
ure	86.56	—
protein	0.25	1.86
fat	0.03	0.22
extract	12.04	89.58
fibre	0.78	5.81
.....	0.34	2.53

ll.,” “ Pflanzenmehl ”, “ Schlempermehl ” and “ Webco ”. These dues are also often mixed with differend meals used as feeds.

No reliable data existed as to the chemical composition of the manioc ls, starch-meals, and residues of the roots. For this reason, the writer le the analyses given in the accompanying five tables.

The writer has also made a detailed analysis of the composition of the tico roots. When well cleaned, they generally contain a little less moist- protein, fibre and ash, but a little more fat and nitrogen-free extract are given in Table I. The analyses show that the roots, like the resi- derived from them, are poor in protein and fat, and that their food depends chiefly upon their starch content. No experimental data are liable as to their digestibility. The carbohydrates, especially the starch, the “ Stärkefuttermehl ” ought to be easily digested.

TABLE V. — *Percentage composition of the manioc root residues ^{known} as "Stärkeabfall" and "Pflanzenmehl".*

Constituents	Fresh material		Dried material	
	Stärkeabfall — per cent.	Pflanzenmehl — per cent.	Stärkeabfall — per cent.	Pflanzenmehl — per cent.
Moisture.	10.3	11.68	—	—
Crude protein	1.12	1.25	1.25	1.4
Crude fat	0.12	0.21	0.13	0.1
N-free extract	80.25	76.60	89.46	86.7
Crude fibre	5.62	4.06	6.27	4.6
Ash	2.59	6.20	2.89	7.0

Amongst the residues analysed, the "Stärkefuttermehl" prepared by Messrs. Zwick & Sons possesses the greatest feeding value. The writer puts it at about £7 a ton, that is about the same as potato flakes. Its starch value of potatoes is taken at 77 per cent., that of the "Stärkefuttermehl" would be 70 per cent.

It is recommended to feed this product mixed with substances containing fat and protein and should these be poor in lime, phosphate of lime should be added. "Stärkefuttermehl" should be an especially suitable feed for calves. From the point of view of the dry matter, "Stärkeschlempe" is equal to "Stärkefuttermehl", but it has the disadvantage of not keeping longer than 14 days. The writer recommends "Stärkeschlempe" especially for pigs; it can be mixed with nitrogenous and fatty substances and it contains lime. Wet "Stärkeschlempe" costs about 3s per bushel, a price which nearly corresponds to its actual feeding value, when the cost of cartage is not very high. As for the value of the other similar commercial products what has already been said as regards "Stärkefuttermehl" holds good. Much care is required in purchasing these products, which are often adulterated by the addition of over 40 per cent. of carbonate of lime.

1174 — The Show of Breeding Stock at Souk-Ahras, Algeria. — ^{MELLES.} *La Revue des Colonies de l'Afrique du Nord*, Year 2, No. 23, pp. 362-361; No. pp. 379-383. Algiers, June 1913.

At the second show of breeding stock organized by the Breeders' Society of Souk-Ahras, held in May 1913, a thousand animals were entered; of these, 560 were awarded prizes.

The class for pure Tarentais cattle was good; the animals seem not to have lost anything in milk production or general characteristics in their home, though they are somewhat darker and more irregularly marked.

The native cattle were chiefly of the Gnelma breed, common in the atainous parts; these animals are of a bright gray colour, with body pact and meaty, legs short, chest deep and wide. The cows are fairly milkers; they cross well with Tarentais bulls.

The cross-bred Tarentais \times native cattle showed a great improvement those of the previous year. Three-quarter-breds are difficult to dis-
nish from the pure Tarantais; the half-breds too, especially the bulls, a predominance of the Tarentais blood, being quite distinct from native cattle in the high-set-on tail, wide hips and other characters; rs at one year may weigh 550 lbs., and at two years 660 lbs. The er believes this cross will be a success and will keep on improving
r careful management and feeding.

Modifications in the Exterior Conformation of the Half-Blood Horse during Growth, in Prussia. — WÖRtz, W. in *Landwirtschaftliche Jahrbücher*, Vol. XLIV, Part 3, pp. 409-436. Berlin, May 1913.

It is some time since the writer pointed out the necessity of having measurements made on animals during the period of growth with the object determining the intensity of development of the several parts of the y. A great number of measurements have been taken, especially the basis of Lyotin and Nathusius' works and systems, on adult mals, but there is a great scarcity of such data on animals during yth. After mentioning the work done in this connection by Gisler, ciley, Schröder and Schöttler, the writer reports upon the systematic measurements made by him since August 1908, upon seven half-blood of East Prussia, about 6 months old. In August 1909 and 1910 the measurements were repeated upon the same animals. Thus the foals were sured at the successive ages of 6, 18 and 30 months.

Immediately after they were purchased the animals fell sick of glandular ination, which for a certain period retarded their development; rtheless they were well cared for and their food was especially rich.

The measurements were most carefully taken so as to exclude errors r as possible.

Some inaccuracies, however, must be considered inevitable, especially certain measurements (thus for instance the length of the neck) which difficult to take on young spirited horses. But taking an average of figures obtained from seven animals tends to produce a compensation ventual errors. Especial difficulties were encountered in measuring length of the fore and hind cannon-bones. The writer measured these es in the fore limbs starting from the pisiform bone and reaching the moids and in the hind limbs from the point of the calcaneum to the se-oids. Both measures thus taken exceed the real lengths of the meta-
ns and of the metatarsus by about one-third, as they include the carpus he fore limb and the tarsus with the calcaneum in the hind one. The unference of the cannon-bone was always taken on the right limb.

The writer gives the results of his measurements in 14 tables, of which last gives the averages of the 7 foals that were measured, both in absolute

figures and in figures relative to the wither height taken as 100. In the separate columns the percentages of growth of the various parts of the horse in the periods of 6 months, 1 $\frac{1}{2}$ years and 2 $\frac{1}{2}$ years are given.

Table I (next page) gives the summary of the data collected.

In two other tables are given respectively the absolute increase in centimetres and the increase per cent. of the various parts of the body. The measures are arranged in the order of their respective intensity of increase.

The figures given in Table I confirm the well-known fact that horses have in comparison much longer legs and shorter bodies than adult horses, while their chest and pelvis are also comparatively narrower.

It appears also that the lengthening of the body is specially connected with the growth of the barrel, that the length (upper and lower) of the neck increases relatively to the height of the withers, whilst (always proportionately) the length of the cannon bones diminishes and the ratio between the height of the withers, of the back and of the croup remains nearly constant. Always relatively, the dimensions of the body (breadth, depth of chest and width between hip-bones), the length of the shoulder-blade and girth, and to a slight extent the circumference of the cannon bone, increase. The circumference of the hock diminishes.

In a separate table the writer compares the results obtained by him on half-blood foals from East Prussia with those obtained by Schöttler on Hanoverian half-bloods. These appear more precocious than the former.

The writer then examines the table in which the absolute growth in centimetres is given for the several parts of the body in progressive order.

He notes that the smallest increases are in those measurements which depend particularly upon the increase in length of the cannon-bones. The other measurements follow in the order given in the table, with maximum for the girth measurement.

Examining the table which shows the data referring to the percentage increase of the several parts of the body that were measured, in the order of intensity of growth, the writer remarks that it varies greatly, ranging from a minimum of 3 per cent. (height at withers) to a maximum of 33 per cent. (width at hip-bones). The increase in length of the fore and hind-cannon-bones was respectively 6.5 and 6.1 per cent., agreeing with Schöttler's observations on Hanoverian foals, in which he also recognized the simultaneous development of the metacarpus and metatarsus. The other measurements follow in the order set forth in the table. Among others the high percentage of the increases in the length of the neck, of the breadth and depth of the chest, and of the breadth between the hips are noteworthy.

In order to give a graphic demonstration of the foals that were measured the writer has added to his work a plan showing the three outlines corresponding to the average of all the measurements, taken respectively at the ages of 6, 18 and 30 months.

TABLE L

Measurements	Average of measurements of 6 and 7 foals respectively.						Increase compared with measurements of 1908			
	1908		1909		1910		1908		1909	
	cm.	cm.	cm.	%	cm.	%	cm.	%	cm.	%
length of body from point of shoulder to point of ischium	120.9	135.4	146.0	96.9	98.7	99.5	12.0	8.7	20.7	
length of forequarters	29.6	32.0	34.2	23.8	23.1	23.3	8.1	7.4	15.5	
" of barrel	53.0	60.6	66.8	42.5	44.2	45.7	14.3	11.7	26.0	
" of hind quarters	36.5	41.1	44.7	29.3	30	30.5	12.6	9.8	22.4	
" of pelvis	—	44.5	46.4	—	32.5	31.6	—	—	—	
from the pisiform bones to the sesamoids	29.3	30.4	31.2	23.5	22.2	21.3	3.8	2.7	6.5	
from the calcaneum to the sesamoids	41.0	42.4	43.5	32.9	30.9	29.6	3.4	2.7	6.1	
length of shoulder-blade	37.9	42.4	46.7	30.4	30.9	31.8	11.9	11.3	23.2	
" of neck (upper)	54.3	62.5	69.0	43.5	45.6	47.6	15.1	13.7	28.8	
" " (lower)	36.6	43.5	45.8	29.4	31.7	31.2	18.8	6.3	25.1	
" of head	—	—	—	—	—	—	—	—	—	
height of withers	124.7	137.1	146.8	100	100	100	10.0	7.8	17.8	
" of back	120.5	133.2	141.5	96.6	97.2	96.4	10.5	6.9	17.4	
" of croup	127.6	140.9	149.8	102.3	102.8	102.0	10.5	6.9	17.4	
" of sternum (behind elbows)	73.6	77.1	81.8	58.9	56.3	55.8	4.8	6.4	11.2	
length of ilium	120.3	131.5	139.5	96.5	95.9	95.0	9.3	6.6	15.9	
" of ischium	113.7	119.1	124.9	91.4	86.8	85.1	4.8	5.1	9.9	
" of knee-cap	85.1	90.4	95.5	68.2	65.9	65.1	6.2	6.0	12.2	
" of hock	56.7	57.4	58.4	45.4	41.9	40.0	1.3	1.7	3.0	
girth of the shoulder joint	93.6	97.5	102.0	75.0	71.2	69.5	4.2	4.7	8.9	
" of elbow	78.4	81.8	85.6	62.9	59.7	58.2	4.3	4.9	9.2	
" of pisiform bone	42.5	44.3	46.3	34.2	32.3	31.5	4.3	4.6	8.9	
width of chest	51.1	60.7	64.5	41.0	43.8	44.0	18.8	7.4	26.2	
at width of chest	29.1	33.1	35.5	23.4	24.2	24.2	13.8	8.2	22.0	
width of chest behind shoulders	27.0	32.4	34.7	21.6	23.3	23.7	20.0	8.5	28.5	
width within hip-bones	35.7	42.6	47.6	28.6	31.1	32.3	19.3	14.0	33.3	
th	133.7	150.4	169.1	107.2	109.7	115.2	16.7	18.7	35.4	
" circumference of fore cannon bone	15.6	17.5	18.5	12.5	12.9	12.6	1.9	1.0	2.9	
" circumference of hind cannon bone	17.1	19.6	20.6	13.7	14.3	14.1	2.5	1.0	3.5	
" circumference of hock	35.0	37.4	38.8	28.1	27.3	26.4	2.4	1.4	3.8	

TABLE II.

Numerical order	Measurements	Average increase in inches to the measurements of 1908 was		
		in 1909 cm.	in 1909-1910 cm.	in 1910 in.
1	Height of withers	0.7	1.0	1
2	Length of pelvis	—	1.9	1
3	From the pisiform bone to the sesamoids	1.1	0.8	12
4	From the calcaneum to the sesamoids	1.4	1.1	2
5	Circumference of fore cannon-bone	1.9	1.0	2
6	" " hind " " "	2.5	1.0	3
7	Height of pisiform bone	1.8	2.0	3
8	Circumference of hock	2.4	1.4	3
9	Length of fore hand	2.4	2.2	4
10	Front breadth of chest	4.0	2.4	6
11	Height of elbow	3.4	3.8	7
12	Breadth of chest behind shoulders	5.4	2.3	7
13	Length of hind hand	4.6	3.6	8
14	Height of sternum	3.5	4.7	8
15	Height of shoulder joint	3.9	4.5	8
16	Breadth of shoulder-blade	4.5	4.3	8
17	Length of neck (lower)	6.9	2.3	9
18	Height of knee-cap	5.3	5.1	10
19	" " of ischium	5.4	5.8	11
20	Breadth between hip bones	6.9	5.0	11
21	Depth of chest	9.6	3.8	11
22	Length of barrel	7.6	6.2	12
23	Length of neck (upper)	8.2	7.4	12
24	Height of ilium	11.2	8.0	13
25	" " of back	12.7	8.3	12
26	" " of withers	12.4	9.7	12
27	" " of croup	13.3	8.9	12
28	From point of the shoulder to point of ischium . . .	14.5	10.6	12
29	Girth	16.7	18.7	3

TABLE III.

Measurements	Average increase in relation to the measurements of 1908 was		
	in 1909	in 1909-1910	in 1908-1910
	%	%	%
Height of hock	1.2	1.8	3.0
From calcaneum to sesamoids	3.4	2.7	6.1
From pisiform bone to sesamoids	3.8	2.7	6.5
Height of shoulder joint	4.2	4.7	8.9
" of pisiform bone	4.3	4.6	8.9
" of elbow	4.3	4.9	9.2
" of ischium	4.8	5.1	9.9
" of sternum	4.8	6.4	11.2
" of knee-cap	6.2	6.0	12.2
Length of fore hand	8.1	7.4	15.5
Height of ilium	9.3	6.6	15.9
" of back	10.5	6.9	17.4
" of croup	10.5	6.9	17.4
" of withers	10.0	7.8	17.8
From point of shoulder to point of ischium	12.0	8.7	20.7
Front width of chest	13.8	8.2	22.0
Length of hind hand	12.6	9.8	22.4
" of shoulder-blade	11.9	11.3	23.2
" of neck (lower)	18.8	6.3	25.1
" of barrel	14.3	11.7	26.0
Depth of chest	18.8	7.4	26.2
Breadth of chest behind shoulders	20.0	8.5	28.5
Upper length of neck	15.1	13.7	28.8
Breadth between hips	19.3	14.0	33.3

1176 - **Cattle Breeding and its Importance in German East Africa. The Various Breeds of Cattle.** — LICHTENHELD, G. in *Der Tropenfänger*, Year 17, No. 4, pp. 405-430. Berlin, August 1913.

The 2 300 000 head of cattle in German East Africa are very unequally distributed. About one-third of the Protectorate is unsuitable for cattle owing to tsetse, and much of the rest is not utilized.

All the cattle, with the exception of some animals imported from Europe, are zebras. They mostly belong to *Bos zebra africanus*, but some are *B. z. indicus* (called Sokota cattle by the writer). Among the African zebras the writer draws a distinction between those with large horns and small humps (Watussi, numbering 750 000) and those with small horns and large humps (Masi, 1 500 000).

I. *The Masai zebus.* — Bred chiefly by the Masai tribe. Colour usually red or yellow and brown, but frequently black or white and grey. Pigmentation generally dark, rarely similar to the coat colour. Skin thick and coarse; hair smooth, short, with a silky lustre. Head often hornless, but frequently with short, stout horns bent slightly upwards. Face slightly dished. Ears medium-sized, directed sideways and slightly backwards. Neck of medium length, with the dewlap usually much developed. Withers wide; hump 12 inches high, and usually more developed in the male than in the female. Shoulders sloping and muscular. Chest relatively deep, occasionally somewhat flat. Body barrel shaped. Ribs and loins of medium length and in a straight line. Croup weak and sloping. Haunches very fleshy. Limbs short, but with small, regular bones. Legs are sometimes crooked, but to no great extent. Tail set on rather low, long and thin, with a large tuft. Hoofs small, hard, and varying in colour from grey to black. Udder small, fleshy, almost hairless, with fleshy teats. The size of the animals varies in different localities and attains an average of 4 ft. 3 in. to 4 ft. 7 in., sometimes 3 ft. or 5 ft. 6 in. in height. The best developed animals are usually found in the hot dry districts, while the less developed occupy the lower ground.

The Masai zebu matures late; cows do not come into heat until the age of 2 $\frac{1}{2}$ years. The bulls and cows are full grown between 3 $\frac{1}{2}$ and 4 years, but steers may go on developing until they are 6 years old.

The Masai zebu is a thrifty animal, and very resistant to weather and disease. The calves are subject to Texas fever, which is prevalent throughout the Protectorate and causes 1 per cent. loss, if the animals contract it during the first months of their life. If the disease appears later, losses can amount to 20 per cent or over. The same occurs in the case of anaplasmosis. Coast fever, in the districts where it is endemic, is responsible on an average for the death of 30 per cent. of the calves; the remainder enjoy life-long immunity; but if this disease is introduced into a hitherto healthy herd, it may carry off 90 per cent. The number of cattle attacked by tuberculosis is estimated by the writer at under 1 per thousand.

The Masai cows calve regularly every year. Calving is usually normal, no assistance being needed, and it is followed by no bad after-effects.

production is normally below 70 gallons per lactation period, but favourable conditions may be more.

The beef production of a two-year-old steer is easily over 220 lbs.; of 5 years of age give up to 440 lbs. of beef, and those of 7 years up to 5. The weight of the hump can attain 24 lbs. The meat contains fibres and is less marbled than that of European breeds. The fat situated chiefly below the skin and round the viscera. These zebus satisfactory draught animals.

I. *The Watussi zebus.* — These are only bred by the Watussi tribe, are a little smaller than the previously mentioned animals. Coat is red, brown or yellow. Head and horns longer than in the Masai. Chest deep, but flat. Line of back and croup straight. Legs often red. Milk production twice as large as in the case of the Masai type, meat production poorer. The animals are less resistant to epidemics and other forms of disease than the Masai zebus; they cannot stand short want of water as well as the latter. These faults recur in crosses between the two types. The Watussi are also less fertile and develop than the Masai zebus.

III. *The Sokotra zebus.* — These were introduced direct from India by merchants and are much appreciated for their good milking qualities, are especially suited to the coast zone, and will, in the opinion of the writer, be still more popular in the future.

IV. *Cattle keeping and breeding by the natives.* — Most of the tribes keep their cattle in the open, but some give them shelter at night. The calves are only put with their mothers for suckling. As the natives milk the cows the calves generally suffer from under-feeding. The large and small domestic animals do not graze together. During the rainy season, for a short time after, the animals are at grass for some hours; during the dry season, they remain in the field all day. When the natural supplies are exhausted, the natives dig wells to obtain drinkable water. In some districts where water is scarce, the animals are fed during the dry season on succulent banana stems. One stem daily is considered sufficient for an animal in the cow-house. The natives have no idea of making hay, or of storing fodder for times of dearth. When the grass of the pasture becomes scanty, the native sets forth in search of fresh fields, drives some of his cattle into good grazing districts, paying in return for the pastureage the milk produced by the cows during their stay.

As a rule, the bulls used for breeding purposes are selected. They are usually chosen for shape, colour and maternal descent, the offspring of milkers being given the preference. Unsuitable animals are castrated. The proportion of bulls ready for service is about 1 to every 20 cows. The bulls are chosen for their good milking properties. A well-proportioned cow may be worth as much as three bullocks. As the natives use all the cows for breeding the herds become very heterogeneous. According to the writer, there is no selection of cows for breeding, for the idea is to use all available animals, and thus increase the size of the herds as much as possible. In order to avoid in-breeding, the native exchanges his breed-

ing animals with those of other cattle owners. The Masai zebus are crossed with the Watussi, but the offspring produced by crossing these types with the Sokotra zebu enjoy equal favour. Most of the native still refuse to introduce into their herds European cattle or their hybrids.

V. *Cattle keeping and breeding by Europeans.* — The methods adopted by the Europeans differ little from those which obtain amongst the natives. The chief aim of the European breeders is to have as large herds as possible. As a rule, their herds are less valuable than those of the natives, which is more to be regretted as they import many bulls from Europe. The writer thinks that it would be best for the European graziers to begin improving the native breeds before trying to introduce European blood. It has been found that European cattle and their crosses have little power of resistance to the climate and the diseases peculiar to the country. It is true that success has been attained recently in rendering European cattle immune from the most serious diseases, such as anaplasmosis and Texas fever; for various reasons, immunisation cannot be practised generally. European cattle if introduced should, according to the writer, be kept in the compound.

Alongside of ordinary farms, where, as on those belonging to the natives, the chief attention is paid to meat production, there are also some dairying farms in the Protectorate. The milch cows on these farms are Sodo or of European breeds; they are always kept in the stall, and receive in addition to grass and hay "mogo" (1) and oil cakes.

VI. *The value and importance of the cattle.* — The price of a steer yielding 440 lbs. of beef varies from 25s to 90s according to locality. Cows fetch a quarter or half as much again.

At Daressalam a gallon of milk costs 2s; at other places its price is 2 ½d to 10d. One pound of fresh butter costs about 3s at Daressalam, 6d at Moschi; 11d at Iringa. One pound of "sami" (2) costs 3d at the chief places of export.

Until lately, the cattle of German East Africa have been chiefly important as providing food for the native breeder, whose prosperity depends for the most part upon his herds. Recently, however, they have also begun to supply the plantation workers and the town populations. Last year about 12 000 oxen were sent for slaughter to the districts of Tanga and Kilimastal. On the other hand, the writer estimates the number of animals which annually find their way to the market at over 40 000. Considering the small amount of business, and the low price of meat, there is no question of the rational utilization of the cattle. In all breeding districts the production of beef-producing animals is noticed. The writer considers that the best means of preventing a crisis in this direction would be the establishment of factories for canning meat and preparing meat extract.

The number of cattle exported from the Protectorate was 545 in 1910, 240 in 1911, and 179 during the first half of 1912. As regards "sami"

(1) This is a tuber of which the feeding value is about equal to that of the potato.

(2) Native-made melted butter.

300 lbs. were exported in 1910, 659 500 lbs. in 1911, and 399 600 lbs. in the first half of 1912.

The duty on exported cattle amounted to about £17 000 in 1910, £10 350 during the first half of 1912. The small numbers exported are partly due to the prohibition of the importation of cattle into neighbouring colonies (except Zanzibar and the Congo) and the law bidding cows being exported from the Protectorate. As draught animals and producers of manure, the cattle in question are of no interest.

VII. *Methods of improving cattle-breeding.* — The writer is of opinion that it would be worth while to improve the breeds of cattle in German South Africa. In order to do this it would be necessary to improve the management of the animals, abandon the practices which lead to the under-feeding of the calves, not allow the heifers to be served by the bull at such early age, and diminish the size of the herds kept in districts poor in food. Hay should also be grown on the farms kept by Europeans, and maize, soya, lucerne, etc., cultivated on dairy farms. A better selection of stud males is very desirable; in-breeding should be avoided, and only immune bulls used in districts where coast fever is prevalent.

The writer advises crossing native and European cattle only for the purpose of improving the milk production, and considers that such crossing should be practised by the European farmers exclusively.

The article is illustrated with pictures of the animals.

7 - *Welsh Black Cattle.* — SABORKSY, PAUL in *Mitteilungen der Landwirtschaftliche Lehranstalt der k. k. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 511-515. Vienna, May 8, 1913.

In a section of his comprehensive work, the writer gives an account of the range of the Welsh Black Cattle and of cattle breeding and agriculture generally in Wales. He then passes on to describe the nature of the hair and coat of the above-mentioned cattle. In section III are given the cranial measurements of 90 of these animals.

The writer has taken skull measurements according to the Adamerz method. The measurements of 15 typical skulls, of which two are of the North Wales type, are given in section IV. Attention is here drawn to the differences between the two types, which consist chiefly in the form of the supra-orbital canals and the lachrymal bone, as well as in the size of the angle of the interparietal bone, the length of the temporal bone and of the occiput. The mandible, the palatine, the nasal, and other bones in both types show indication of descent from a *brachyceros* type, while the maxilla recalls that of *Bos primigenius*. The skulls in North Wales show more signs of *primigenius* descent than do those in the South part of the Principality. The writer concludes from the measurements that both types are nearly related, but owing to the great differences in the skulls, he thinks they should be regarded from the agricultural standpoint as independent race types. A mixed origin is unlikely. It is certain that the Welsh black cattle, like other old British breeds, are descended from a specific wild type, perhaps a variety or a subspecies of

Bos primigenius, and thus occupy a special position in the stock-breed system. From the combination of *primigenius* and *brachyceros* characters in the skull, the writer classifies this breed as *pseudoprimigenius*.

1178 - *Carcasse Test of the Piedmontese Breed of Cattle* — MASCHERONI, E. *Cronaca Agricola*, Year XVIII, No. 12. Turin, July 1, 1913.

Though the Piedmontese cattle are considered a general purpose breed (meat, milk and work), nevertheless as producers of meat they are doubtless among the best Italian breeds, if not perhaps the best of all. Formerly this breed contributed largely to the exportation of cattle to France and Switzerland.

The Piedmontese cattle mature early; frequently it is found that at the age of 18 or 20 months animals of this breed weigh 1320 lbs, and up to 2000 lbs and at the age of four years considerably above 2200 lbs. The meat is excellent quality. The animals are easily fattened without much expense and the percentage of dead weight is high.

Doctor Poli, chief of the Municipal Veterinary Office of Turin, was trusted by the Ministry of Agriculture, in 1887, with the task of determining the net carcass weights of Piedmontese cattle; from observations made by him it appears that of 31 head of cattle taken at random, 14 gave dead weight percentages ranging between 49 and 55, and 17 above 55; of the latter 9 were above 60 and one reached 66.

1179 - *The Correlation between the Percentage of Milk Fat and the Quantity of Milk Produced by Ayrshire Cows*. — *Journal of the Board of Agriculture*, Vol. XX, No. 5, pp. 447-448. London, August 1913.

An investigation was undertaken by the Board of Agriculture owing a desire for figures showing as definitely as possible the extent of the correlation between the quantity and quality of milk yielded by a cow. The work of preparing a report on the subject was entrusted to Mr. H. D. Vig, an Assistant to the Head of the Statistical Branch of the Board. It was thought desirable to include in the calculations such other variable factors as might affect the milk yield of the cow and the percentage of fat content in the milk, and for this reason it was decided to deal also with the age of the cow, the duration of lactation and the date of calving. The conclusions are derived from data contained in a Report of the Ayrshire Cattle & Records Committee.

The conclusions drawn are:

- 1) After allowance has been made for the varying age and duration of the lactation period of the Ayrshire cows under examination, the number of cows which gave the larger average weekly yields of milk shows a definite and appreciable tendency to be poorer in milk fat than the milk of cows which gave lower average weekly yields.
- 2) The duration of lactation had no significant influence upon the average percentage of milk fat produced.
- 3) The percentage of milk fat showed a slight, but definite, tendency to be lower in the older than in the younger cows, after due allowance has been made for the average weekly yield of milk.

4) Taking the herd as a whole, the duration of the lactation bore no relation to the average weekly yield of milk produced by cows. There is no evidence in the case of these cows, of a selective action in favour of keeping in milk those cows that gave a better average yield of milk than others.

5) In the herd under examination, the older cows show a definite appreciable tendency to give larger yields of milk than the younger ones. This may possibly be due partly to a selective action in weeding out cows which proved unpromising as regards their milk yield when young, partly to a physiological tendency for older cows to give better yields than younger ones.

6) The duration of lactation has possibly tended to be longer in older cows than in younger cows, although the evidence on this point is not quite definite.

If it is supposed that the average age and duration of lactation remain unaltered, it appears possible to select a herd with an average yield of nearly 10 gallons per cow per lactation (as compared with the 1909 average yield of 6.37 gallons), without reducing the average percentage of milk fat produced in the herd as a whole below 3.58 per cent., as compared with the present average of 3.68 per cent. It must be borne in mind, however, that while this result may be regarded as the most probable, in the long run the certainty of attaining it diminishes when only a small number of cows is being dealt with, and increases proportionately with the number of cows in the herd in which the policy of selecting cows with higher milk yields is pursued.

Investigations into the Daily Variations in the Specific Gravity and Fat Content of the Milk of a Large Herd (1). Kloss in *Bericht über die Tätigkeit des landwirtschaftlichen Instituts zu Proskau für das Jahr 1912-13*, pp. 11-12. Oppeln, 1913. *Landwirtschaftliches Centralblatt*, Year 42, Part 13, pp. 365-392. Hanover July 1, 1913. In March, May, July and October, 1912, the writer investigated the specific gravity and fat content of the milk of 70 cows belonging to the herd of the Proskau Dairy Institute. Tests were made thrice daily. These cows were selected, as it was important that the period of investigation should include months during which the food was qualitatively the same, others when the rations varied. The cows' rations in March consisted of straw, brewer's grains, and sunflower and sesame cakes. In May, the animals received nearly the same food as in March for three weeks, and then were put out to grass until the end of July. From the 6th October, the cows grazed half the day, and until October 17, when they returned to the shed, they were given grains, linseed cake, mangolds, straw and hay. From the 17th to the 25th of October the linseed cake was replaced by sunflower cake, and from the 25th to the 31st crushed barley was substituted for concentrated food.

(1) See No. 298, *B. March 1913*.

The daily variations in the milk content of each milking (morning, noon and evening), and the variation in the content of each day's milk (the arithmetical mean of the milk of the morning, noon and evening milking) are given in tables. If the results of the different months are compared it is seen that the greatest variations in the content occurred in the two months March and July, when there was no change in the rations. While in March 18.9 per cent. of the single milkings and 3.3 per cent. of the daily milkings showed a variation in fat content of from 0.2 to 0.45 per cent., in July 34.4 per cent. of the former and 23.3 per cent. of the latter showed variations of the same amounts. The greatest variations in fat content were in July, when they reached 0.7 and 0.35 per cent. for single milking and the day's milk respectively; in March, the highest variations were 0.45 and 0.16 per cent., respectively. In May, the highest variation in the fat content of the single milkings was 0.7 per cent., and that in the day's milk 0.25 per cent. In October, the highest variation in the single milking was found to be 0.5 per cent., and that in the day's milk 0.26 per cent.

The number of variations in the single milkings were: 17 in March, 27 in May, and 31 in July and October respectively. The greatest variations in fat content in the day's milk occurred in July (during the full grazing season). Next come October and May (when the rations were varied). The day's milk showed least variation in fat content in March (when the rations were always similar).

In glancing over the variations in specific gravity, the similarity of the returns for March and October (when the cows were mostly stalled) and those for May and July (when the cows were mostly at grass) is very striking. In March and October, 10 per cent. of all the single milkings varied in specific gravity more than 1 lactodensimeter degree in 24 hours (highest variation 1.9 degree). In May and July, the number of single milkings which attained this amount of variation (highest variation 3.7 degrees) reached 33.3 and 31.1 per cent respectively. In spite of these numerous and large variations in the single milkings, the fat content of the daily milk showed a considerable adjustment of the differences.

The greatest daily variation of specific gravity was in July (0.0037), the smallest in October (0.0015). In March and May the variations do not exceed 0.002. The highest variations which occurred on change of rations were on an average:

Periods	Variations in fat content	Variations in specific gravity (lacto densimeter degrees)
—	—	—
May 4-7	0.45	1.2
Oct. 6-8	0.30	0.8
Oct. 17-19	0.25	1.0
Oct. 25-27	0.50	1.1

It is thus evident that the variations in fat content and specific gravity were not much greater when the rations were changed. The writer concludes that the current idea that the variations in fat content of the milk of a

on approximately similar rations are small, is a fallacy, and that in regard to adulteration, as much stress must be laid upon alterations in specific gravity of the milk as upon the variation in the fat content. The writer does not consider that fat content variations of 0.2 per cent even up to 0.3 or 0.4 per cent, are alone sufficient to prove adulteration, but they must be accompanied by a difference of 0.002 or more in specific gravity. In passing judgment upon milk from the examination sample taken in the shed, the alteration in the specific gravity is the point to be noticed. Repeated fat determinations constitute the method of judging milk from the butter-making point of view.

The Possibility of Increasing, with Economic Advantage, the Average Fat Content of Cow's Milk. — HANSSON, NILS in *Kungl. Landbruks-Akademiens Meddelanden och Tidsskrift*, Year 52, No. 5, p. 289. Stockholm, 1913.

Among the components of milk, fat is the most valuable, both when milk is as such and when it is used for butter or cheese making; thus the eco-

Schematic diagram showing the composition of the dry matter of milk for different fat contents (as abscissae).

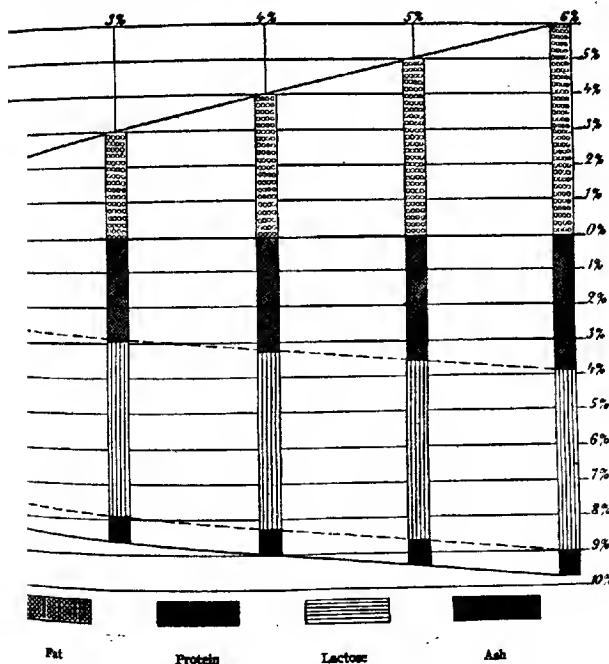


TABLE I. — *Average composition of the dry matter in milk.*

Fat in milk	Solids not fat in milk	Total solids in milk	Fat in the total solids	Solids not fat in milk of fat
%	%	%	%	%
2.00	8.31	10.31	19.4	415
2.25	8.46	10.71	21.0	376
2.50	8.51	11.01	22.7	341
2.75	8.57	11.32	24.3	312
3.00	8.72	11.72	25.6	291
3.25	8.83	12.08	26.9	272
3.50	8.96	12.46	28.1	256
3.75	9.05	12.80	29.3	241
4.00	9.16	13.16	30.4	229
4.25	9.29	13.54	31.4	218
4.50	9.30	13.80	32.6	207
4.75	9.30	14.05	33.8	196
5.00	9.33	14.33	34.9	187
5.25	9.37	14.62	35.9	179
5.50	9.36	14.86	37.0	170
5.75	9.34	15.09	38.1	162
6.00	9.31	15.31	39.2	155

nomic importance of producing cheaply a milk rich in fat will be perceived at once.

Without waiting for the theoretical solution of the problem, for the last quarter of a century attempts have been made in Sweden to realize it in practice. The writer, who is chief of the Animal Husbandry section of the Central Agricultural Experiment Station of Sweden, discloses in this paper the circumstances which exert an influence on the results and gives a résumé of what has been obtained up to the present.

In comparing the numerous analyses of milk that have been made during the course of feeding experiments carried out during 13 years at Bonn and those that were made at Tranekjaer and Bregentved in Denmark, the writer found that the composition of the dry matter in milk varies very regularly with its fat content, independently of the breed of cow, of the time of year,

TABLE II. — *Food required to produce milk richer or poorer in fat, calculated according to the composition of the milk. Average yearly production 3,300 kg. (6600 lbs.) of milk per cow. Live weight 450 kg. (990 lbs.).*

Milk per year	Food requirement of cow per year	Food requirements for the production of					
		Food units	1 kg. of fat	100 kg. of milk	1 kg. of dry matter of the milk		
			Food units	Food units	Ration of production	Ration of upkeep	Total
50	1 909.0	25.5	63.6	2.46	3.32	5.78	
75	1 955.9	23.7	65.2	—	—	—	
90	2 002.0	22.2	66.7	2.58	3.11	5.69	
25	2 048.7	21.0	68.3	—	—	—	
50	2 095.0	20.0	69.8	2.68	2.93	5.61	
75	2 145.5	19.0	71.4	—	—	—	
90	2 188.0	18.2	72.9	2.77	2.77	5.54	
25	2 234.5	17.5	74.5	—	—	—	
50	2 281.7	16.9	76.1	2.86	2.65	5.51	
75	2 329.1	16.3	77.6	—	—	—	
90	2 376.4	15.8	79.2	2.98	2.55	5.53	
25	2 423.3	15.4	80.8	—	—	—	
50	2 471.0	15.9	82.4	3.09	2.46	5.55	

calving, and of the feeding. This is shown by the accompanying diagram and by the figures of Table I, which give the composition of the total milk, and according to which the solids not fat increase with the extent, but to a lesser extent.

This increase concerns almost exclusively the protein content, which is one-quarter of the total solids; it does not affect either the lactose or ash, the quantities of which, according to the analyses used, are always constant relatively to the quantity of milk, namely about 1.5 per cent. of lactose, and 0.7 per cent. of ash.

This signifies that the richer a milk is, the less does the production of non fat influence the production of fat.

Taking these ratios of the components of milk as a basis, the influence of fat content of the milk on the food requirements of the cow has been calculated.

TABLE III. — Consumption of food for the production of 1 kg. of milk

Average fat content of milk of the herds %	Food units per 1 kg. of fat	
	Southern province Malmöhus	Central province
2.80 — 2.89	(25.6)	—
2.90 — 2.99	23.4	—
3.00 — 3.09	22.4	—
3.10 — 3.19	21.5	21.5
3.20 — 3.29	21.1	20.8
3.30 — 3.39	20.5	20.1
3.40 — 3.49	20.4	19.7
3.50 — 3.59	19.8	19.3
3.60 — 3.69	19.9	18.7
3.70 — 3.79	18.0	18.3
3.80 — 3.89	17.8	18.4

According to the standard of feeding of cows established by the *vit* on the basis of the results obtained by the milk control societies, one food unit is required for the production of 6.6 lbs. of milk. Supposing that this standard refers to the production of a milk containing 3.5 per cent. of fat, the food required for the production of milk having another fat content has been calculated by valuing the proteins and lactose as fat according to their calorific value and supposing, with Kellner, that 0.55 lb. of fat corresponds to 2.2 lbs. of starch value (= 1.65 Swedish food units). The result of this calculation (see Table II) is that for the production of 2.2 lbs. of fat the food requirements of the cow diminish, but following a decreasing ratio, with the increase of the fat content of the milk. For the production of 220 lbs. of milk, this requirement increases following a continuous ratio of about 1.5 food units for 0.25 per cent. of the increase of fat content.

This increase of consumption of fodder does not seem to be connected with the quantity of total solids. On the contrary this ratio is almost constant, for if the quantity of fodder required for the production of a certain quantity of solid be divided into its two parts (ration for upkeep and ration for production), it will be found that the increasing amount of fodder required for production, which depends upon the greater calorific value of the fat compared with that of the other components of milk, is balanced by the decreasing quantity required for upkeep distributed over the total solids produced.

This theoretical deduction is further checked by an investigation on the results of the milk control societies. This investigation was made with

of showing the difference in the consumption of fodder for the production of 1 kg. of fat and of 100 kg. of milk of varying richness. Table I gives the figures for the controlled herds of the most southern and those of the three central provinces in separate columns, the consumption of fodder separately for each herd.

The results are grouped according to the average fat content of the milk. The figures for 2.75 to 3.75 per cent. of fat correspond as well with Table II as among themselves, especially if it be considered that the figures of Table II are calculated for cows weighing 450 kg. (990 lbs.) and exactly 3000 kg. (6600 lbs.) of milk, whilst the figures of Table III are for cows of varying weights and yields. In this table the figures for the poorest and of the richest milk are based on so small a number of cows as to have very little value.

The practical results of the control societies thus show, by their agreement with the theoretical deductions, that fat may be produced with a much greater consumption of fodder in rich milk than in the poorer milk. At content is increased from 3 to 4 per cent., the consumption per kg. of fat is reduced by 4 to 4.5 units, that is by about 1.8 per cent. quantity of food necessary for the same production in milk containing 4 per cent. of fat. The very small diminution of solids not fat relatively to the quantity of fat which thus results from the increase of the fat, has next importance economically owing to the low value of these components. Increase in the fat content of milk leads to considerable profit especially where milk is used for the manufacture of butter or where it is sold according to its real value. But for the very frequent cases in which the price of milk is fixed independently of its fat content, it becomes important to know if the production of fat milk requires more fodder than that of milk. In order to resolve this question, the writer compared groups yielding milk of different fat content; he has arrived at the results that the consumption of forage per kg. of milk grows proportionally to the fat content. The calculation of this ratio has yielded somewhat different results, but it may be admitted as an average that an increase of 1 per cent. of fat corresponds to an increase of 6.3 food units per kg. of milk, which agrees with the figures of Table I. For a butter which is paid 2 kroner per kg. (1s a lb.) this increase of 1 per cent. of fat in 100 kg. of milk is worth nearly 2.2 kr. (2s 5d), but 6.3 units are worth less than 0.7 kr. (9 1/4 d). It is thus proved that the greater the fat content of the milk, the greater is the food required for the production of a richer milk. It is thus evident that it is more economical to produce a rich milk if it is paid according to its real value. But this is not the case when the increase in the fat content of the milk is obtained at the expense of the average quantity of milk, because it is only upon this that the cost of the production of milk depends. After having thus treated of the advantage of an increase in the fat content of milk, the writer reviews the means to be adopted to obtain it and the results which have been hitherto achieved in Sweden. It has been proved, that certain kinds of food, such as palm and coprah cakes and

the leaves of beets, have a tendency to increase the fat content of the milk produced, whilst others, such as poppy and German sesame, and inferior rice flour, act in the opposite way. Nevertheless it is by feeding that sure progress is to be expected, but by selection in breeding with this object in view.

This truth has long been recognized in Sweden, but even now the progress has been in general but slight, whilst in Denmark it is very marked. The writer nevertheless mentions some Swedish herds in which a decided progress has been noted during recent years, as is proved by the figures of the breeding centre competitions (1). One herd especially, of Alberga, of Ayrshires, gives a good example and unassailable proof of the manner in which this progress has been realized.

The writer mentions the Kolle-Kolle herd in Denmark as a fine example of the influence that a bull may have by the capacity of transmitting to the female line a high productiveness of milk rich in fat. He gives a list of the bulls most employed for the development of the Friesian breed in Sweden, with notes on the production of milk and in the daughters of these bulls as compared with the production of their dams. He demonstrates that most of these bulls have transmitted to their daughters a productiveness greater than that possessed by their dams. On the other hand, some of them have exercised a contrary influence upon the quality of their descendants.

In order to demonstrate the practical possibility of increasing the production of butter fat by means of the selection of the breeding animals, the writer gives a summary of the development of the Alberga herd and the choice of the bulls that were used. Thanks to the determination of the quantity of milk and of its fat content made regularly since 1891 for all the cows of the herd, it has been possible to calculate separately the production of milk and of fat for the groups of descendants of each bull and of each cow.

As for the bulls, five have had a remarkable influence on the development of the herd. If the cows are distributed in families according to the bulls that were their sires, or paternal grandsires, a great difference in average quantities of milk and butter fat of the different families will be observed. But in order to establish with certainty the influence of each bull upon his offspring, it would be necessary to compare separately the production of his daughters with that of their mother, making such comparisons at the same age, that is to say for the lactation periods following the first, second, third, etc., calving. In this manner the influence of the normal increase in production during the first lactation periods would be eliminated.

This comparison has been possible for only two of the Alberga bulls. For the other three bulls only the average figures for all the years of production of their daughters and of the dams of these were available.

(1) For the definition of the breeding centre competitions in Sweden, see WANDER's original article: "The Development of Cattle Breeding in Sweden," p. 12 of this *Bulletin*.

TABLE IV.

Names of bulls	Number of daugh- ters	Con- trolled during years	Sum of years of control	Average yields		
				Milk kg.	Fat %	Fat kg.
S	61	5.92	361.12	2 545.1	3.70	94.17
	61	3.59	218.99	2 347.3	3.59	84.31
				+ 197.8	+ 0.11	+ 9.86
B	69	3.78	260.82	2 863.6	3.78	108.31
	69	3.61	249.09	2 535.1	3.61	91.64
				+ 328.5	+ 0.17	+ 16.67
W's Joy.						
WS	26	4.54	118.04	2 811.0	4.01	112.76
	26	3.70	96.20	2 537.1	3.70	93.92
				+ 273.9	+ 0.31	+ 18.84
WS	11	—	37	3 470.1	3.90	135.35
	11	—	37	2 780.5	3.72	103.47
				+ 689.6	+ 0.18	+ 31.88
V.						
WS	15	—	30	2 672.6	4.30	115.01
	15	—	30	2 914.2	3.90	113.58
				— 241.6	+ 0.40	+ 1.43

These results of the comparison are shown by the figures of Table IV, where the increase (+) or the decrease (—) of the production of the each family compared to those of their dams.

Five bulls have all of them caused an increase of the fat content of milk, and four of them have also caused an increase in the quantity produced, but from this point of view the fifth has caused such a rise that the progress in the production of fat has been almost nil. Nevertheless, in order to be just in the verdict on the value of a bull breeding purposes, the productiveness of the cows with which he is mated must be observed. The higher this was, the more difficult it became for

the bull to raise it still higher. The writer has illustrated this fact by ing the dams of each family of a bull according to the fat content of milk. From this grouping it appears that the poorer the milk of the the more could all the bulls cause the fat contents to rise. In the in which the milk was richest two of the bulls have caused the fat contents sink. A bull may thus act favourably on the average fat content of a herd and exert an unfavourable action in another herd in which faculty of yielding a rich milk is more developed.

Calculating the average fat content of the milk of all the descendants of a bull, the writer has determined the fat content that this bull represents and which he can transmit as inheritance. He calls it "genotype fat content percentage" of the bull.

The writer summarizes as follows the results of his investigations influence that the choice of the bulls has on the fat content of the

1. It is possible to increase the percentage of fat content of the of a herd, with economic advantage, by a judicious selection of the breeding animals.

2. By dividing a herd into families of descendants of the sires and the dams, the influence of each animal on the development of the percentage of fat content of the herd may be better demonstrated.

3. The influence of the males is demonstrated by the average production of all their female descendants, or still better by a comparison of the age production of their daughters with that of the dams of these daughters when they were of the same age.

4. The influence of the bulls on the percentage of fat content of the of their female descendants depends upon the qualities of the females preceding generations.

5. The influence of the cows appears in the fact that a bull possessing a certain genotype percentage of fat cannot increase the percentage of fat in the milk except in the daughters of cows inferior to him in the percentage of fat content, whilst the daughters of the same bull out of cows producing richer milk will have a percentage of fat inferior to that of their dams.

6. The males and the females transmit to their descendants the percentage of fat which they themselves have inherited from their ancestors, male and the female having, as it appears, an equal influence on condition that they represent the same constancy of results in this respect. But due to its larger number of descendants, the male has a greater influence on the development of the herd.

7. Nevertheless, as is usually the case in questions of heredity of quantitative characters, variations are frequent, so that some particular animals may have an average fat content percentage very different from that of the sire or of the dam; but the average percentage of all the descendants is in general very near to the average genotype percentage of fat of the sire and of the average fat content of the dam's milk.

8. For the improvement of animals, as well as for that of plants, it will be sought to unite the qualities having the greatest practical value, effort towards the attainment of such a high yield of milk as will

ous to the health of the animals must be carefully avoided, as well as figures in the butter fat content. But everywhere where milk is according to its quality, the object in view should be to combine the in these two directions in order to attain a high production of fat.

The principal means of increasing the fat content of the milk is a scrupulous selection of the breeding animals, especially of the bulls, judging the percentage of butter fat according to: *a*) the average percentage milk of their dams, grandams and sisters; *b*) the influence of their sires ramsires on their daughters; and, when the bulls are sufficiently old, *c*) own influence on the average per centage of butter fat in the milk of female descendants.

The Improvement in Sheep-Breeding in Algeria. — COUSTON, F. in *La Revue des Colonies de l'Afrique du Nord*, Year 2, No. 31, pp. 488-490. Algiers, July 21, 1913. The official statistics give a total of 9 million sheep for Algeria; of one-fifth are found on the sea-coast and the Tell, and four-fifths in the arid and the semi-arid plateau steppes. Efforts for improvement therefore necessarily be devoted to varieties of sheep adapted to the mentioned districts. Hitherto, the breed most used for improving native sheep has been the Rambouillet, although Crau and Spanish Merinos are also imported. So far, no satisfactory results have been obtained, as are not suited to the food and climatic conditions obtaining in Algeria. On the Government sheep-farms at Taadmit, Birin, Ben-Chicau and Toudjbeur, the Rambouillet Merinos die very soon after importation, lambs even do not live. The veterinaries and sheep-breeders are of opinion that the Rambouillet sheep is unsuitable to Algeria. The writer has also little hopes of the greater success of the more resistant such as the Spanish and Crau Merinos. They have shown themselves to have little adaptability, and have only yielded moderately satisfactory results when mated with the native breeds.

According to the writer, the Algerian sheep-breeding industry can only be proved rapidly and economically by means of a rigorous selection of native breeds. Three of the latter are especially adapted to this end: the Ibran, Hodna and Ouled-Djellal sheep; they are all hornless, stand in high, and when full-grown give as much as 66 lbs. of mutton. In order to improve the breeds, the writer recommends the careful selection of best rams, and their distribution by the State to the sheep-breeders.

Fourth Egg-laying Competition in Tasmania. — Profitable Egg-Production in *Agricultural Gazette of Tasmania*, Vol. XXI, No. 5, p. 184. Hobart, May 1913. The fourth egg-laying competition, held at Springvale, has recently ended, and it is interesting to note some of the chief features in this competition.

In 1909-10 a pen (6 fowls) of White Leghorns scored highest honours, a total of 1248 eggs. In 1910-11 Black Orpingtons came to the fore 1318 to their credit. In the two last competitions White Leghorns topped the list with 1250 eggs in 1911-12, and for the season just

finished 1272 eggs. The all-round average of the birds competing improves.

Last year it was pointed out that a perusal of the lists of eggs showed that, as compared with previous competitions, there was no "falling away" in the number of eggs laid in respect to pens at the bottom of the list. The first competition 28 pens competed, and five of these produced less than 800 eggs each. The second event saw the number of pens increase to 33, and six pens fell below 800 each. Last year the competition had 33 pens, and only two of these fell below 800 eggs. This year the three lowest recorded 943, 956 and 983 eggs respectively. This means that the 10 pens in the competition averaged over 157 eggs per bird.

Approaching the results arising from this year's work from an standpoint it will be seen that 19 pens out of the 29, or over 70 per cent recorded more than 1200 eggs per pen, which means that each bird in these pens averaged over 200 eggs. (1). No meat was employed in the diet of the birds competing, but skim-milk and lucerne were provided to give protein. The following table shows the first three pen yields and lowest three for the four competitions at Springvale:

Highest.				
1 st year	1248,	1179,	1155;	total: 3582
2 nd " "	1318,	1298,	1215;	" 3831
3 rd "	1250,	1201,	1188;	" 3639
4 th "	1272,	1261,	1261;	" 3794
Lowest.				
1 st year	670,	654,	410;	total: 1734
2 nd "	661,	614,	614;	" 1889
3 rd "	801,	794,	632;	" 2227
4 th "	983,	956,	943;	" 2882

It is at the tail end where any improvement will be noticeable, as find that the lowest pen yield in the 4th year more than doubled the number of eggs laid in the corresponding pen entered the first season.

1884—*Ostrich Farming in Australia*.—HERBERT, T. J. in *The Agricultural Journal of New South Wales*, Vol. XXIV, No. 6, pp. 511-521. Sydney, June 2, 1913.

Several shipments of ostriches have from time to time been imported into Australia. In 1873 the Melbourne Acclimatization Society imported some; and later, in 1881, Mr. W. Malcolm set about establishing ostrich farming in South Australia, and imported a number of birds. A farm started at Gawler, and a large number of young ostriches were successfully hatched and reared.

About this time an Act was passed by the South Australian Government with a view to encouraging the establishment of the industry, by offering

(1) The grand total of eggs laid by the 29 pens competing was 34137, or an average of 1177 eggs per pen, and as there were six birds per pen the average of each bird was as high as 196 eggs. No substitution of birds was practised in this competition. (SA)

ample of 5000 acres of land to the party who first placed 250 ostriches one year old upon the land. Mr. Malcolm's venture was formed into company (the South Australian Ostrich Company), which obtained 5000 near Port Augusta under these conditions.

The country in the neighbourhood of Port Augusta, with an annual rainfall of only 9 inches, must be classed as inferior pastoral land. The birds have thriven, and a flock of 700 is now pasturing on the without any artificial feeding except during the first few months of their when they are fed on lucerne and bran. One and a half acres of lucerne are grown and watered from the town water supply. The farm is handicapped by not being able to produce more green fodder; wise a greater number of chicks could be reared. The improvement in the plumage brought about by feeding lucerne was strikingly when eight birds were sent to Melrose, about 40 miles distant, where were grazed in a lucerne paddock. The feathers were clipped and sold Melbourne manufacturer, realizing £7 per clip per head, or more than the amount realized from the same birds when grazed on the scatted paddocks at Port Augusta. Birds from the Port Augusta farm been the origin of almost all the ostriches now pasturing on the various throughout the Commonwealth.

In South Australia itself there exists another flock of 400 birds, running station near Lake Alexandrina, the nucleus of which came from Port sta.

In New South Wales there is a flock of 100 head at South Head, near ey, which thrives well, but whose further expansion is limited by lack ace. At Hawkesbury Agricultural College a second flock has been oped from a single pair acquired in 1900, and produces feathers of high quality.

Another flock was started at Nardoo, near Coonamble, in 1905, with of birds from the South Australian Ostrich Company; the birds now er 550 and it is proposed to increase them still further; 2500 acres are ed to their use, and the owner of the flock, who also has a 5000 - acre run, intimates that he receives greater net profits from the ostriches from the sheep, though no birds have yet been sold. An artesian rovides abundance of water, and 30 to 40 acres are under lucerne, ng a cut about every six weeks in summer; this is grown more as a re of precaution against possible drought than from absolute neces- or, so far as present experience goes, hand feeding is rarely required. ay is stored and when fed is chaffed, damped, and mixed with bran or

It is estimated that the land will carry 1 herd (or 3 sheep) to every s, running on natural pasture alone. It will probably prove more ble to grow fodder, as this would not only increase the carrying ca- of the land, but also raise the quality of the feathers.

The writer has an ostrich farm on the Yanco Irrigation Area; its area acres, of which 108 are irrigable and destined to lucerne. The flock lit up from birds from the South Australia Co., and at present num-

bers 90 birds; last year 12 Soudanese ostriches were imported from Africa to be mated with the South Australian strain.

A flock of 24 adult birds, the progeny of the Hawkesbury College, has also been taken to Queensland, where attention is now being paid to subject of ostrich raising.

1185 - **Further Report on the Isle of Wight Bee Disease.** — *Supplement to the Journal of the Board of Agriculture*, London, July 1913.

This supplement contains a detailed account of the progress of the investigation into the cause of the Isle of Wight Bee Disease. The late attended by certain symptoms, such as inability to fly, the presence of merous bees on the ground in front of the hives, and the dwindling of many other symptoms have however been recorded, and no one of this characteristic of the disease. The only essential feature is the death large numbers of bees, and often of the whole stock, especially during wet and cold periods of the year, or during the winter months. The disease is probably endemic, but owing to lack of information, it probably passes unnoticed in mild seasons, the loss of bees being attributed to starvation, spring dwindling, etc.

During the years 1911 and 1912, *Nosema apis* in some stage has been found in almost every stock apparently suffering from the Isle of Wight disease which has been examined, and, moreover, no bacteria other than those found in normal bees have been detected. It can therefore be said with confidence that *Nosema apis* is the agent responsible for most of outbreaks in which the symptoms of the Isle of Wight disease have been noticed, or in which the stocks have dwindled or died without apparent cause.

1186 - **Domesticated Reindeer in Newfoundland.** — *The Field*, Vol. CXXI, No. (Supplement), London, June 28, 1913.

Dr. Grenfell, the famous Labrador missionary, has been using reindeer teams for hauling his *kometiks* (sleds) in the various trips he has made from his headquarters at St. Anthony along the coast of northern Newfoundland during the past winter. He speaks most enthusiastically of the reindeer experiment, which has appealed so strongly to the Canadian authorities that the Dominion Department of the Interior purchased 40 of these animals last summer for its own use. They were transported from Newfoundland to Edmonton and thence to the Mackenzie delta to be used by the mounted police for drawing teams in winter, so as to prevent a repetition of the tragedy which attended the effort of Inspector Fitzgerald's party to cross the frozen wastes during the winter of 1910-1911.

In the northern part of Newfoundland there are very few horses and dogs for haulage purposes. The same is true of Labrador, where the conditions are even worse, as the Labrador dogs are vicious brutes which attack and devour even human beings. Dr. Grenfell took up the reindeer experiment with the idea of inducing the people to substitute reindeer for dogs as soon as he could supply them with sufficient of the former. Reindeer are also useful in providing milk, which is much needed for the children.

opagate very rapidly, it is believed that it will be possible in a few years to kill them for food purposes, and thus help to supply the domestic

original herd, consisting of 300 Lapland reindeer, was imported by Grenfell about five years ago, with a fund of \$ 15 000 raised partly in Canada, and partly in England, with \$ 5 000 contributed by the Canadian Government. This herd has increased naturally and now numbers over 1 200. One reindeer will do more work than six of the dogs formerly used. Grenfell adopted the idea of introducing reindeer into Labrador, and late Dr. Sheldon Jackson, who introduced them into Alaska twenty years ago. The latter, in spite of many difficulties, succeeded in obtaining a number of these animals, which by successive additions and natural increase now amount in number to 15 000. The world received an important lesson in 1896 when a number of whaling ships were frozen fast in the Arctic circle and a herd of 500 reindeer were driven 700 miles to supply them with food.

Reindeer can be used as saddle and as pack animals ; they can take 150 lbs. on their backs. Harnessed to a sled, two of them will pull 500 lbs. thirty miles daily. Keliman drove his reindeer express on one occasion 95 miles in one day. At present the most northerly mail route is served by reindeer. No food need be carried for them, as at the end of each day's journey they are unharnessed and at once dig through the snow with their powerful hoofs to the white moss below, which serves as food.

When Dr. Grenfell began his experiments in Newfoundland, he was fortunate enough to secure the services of Capt. W. C. Lindsay, a retired Army officer. The latter took over the control of the herd of reindeer under his skilful and capable management even better results were achieved than by the American Government in Alaska. The percentage of living fawns from the Alaskan deer, as given in the Government records, is 40 per cent., whereas at St. Anthony it is nearly 100 per cent. The only trouble that is found at St. Anthony is that the dogs sometimes attack the deer, and the latter in running away over the rough ground break their legs and have to be killed.

No endeavour was made in the summer of last year to secure a number of wild caribou to cross with the reindeer, but owing to the plague which was unusually bad, the idea had to be given up. It is hoped that there will be greater success this year.

Reindeer wandered considerably more last winter than the preceding winter ; this was due, in the opinion of the Laplanders, to the fact that the natives have learnt that there are no wolves in the country to fear. For another season, it is proposed to break up the present large herd, and distribute it among the Mission Stations in Labrador, where, after the period of reproduction has continued for some time longer, the Alaskan natives will probably be lending small herds to the natives to enable them to replace the lost.

FARM ENGINEERING.

1187 - Motor Plough Competition at Königsberg. — MARTINY in *Maschinen Rundschau*, No. 2, pp. 6-9, Königsberg, July 1913.

The Chamber of Agriculture for the province of East Prussia organized a motor plough trial in a field at Löwenhagen, Königsberg on June 4, 1913.

The following motor-ploughs were presented:

The "Ihace" : 45 to 60 H. P.; it weighs, with ploughing tackle, 16 cwt., and costs £ 1127.

The "Podeus" : 65 H. P., weighs, with five-share balance plough, 7 cwt., and costs £ 1078.

The "Pöhl" : 70 H. P.; it weighs, with plough, 5 tons, and costs £ 833.

The "Arator" : 50 H. P.; weighs, with plough, about 5 tons, and £ 882.

The "Ergomobil" : 30 to 35 H. P.; weighs, with plough, 9 tons, and costs £ 1054.

The "Stock" : this costs without reversing gear £ 833; with it £

The "Wede" : 56 H. P.; weighs 5 tons and costs £ 933.

The "Komnick" : costs about £ 980, and weighs about 4 tons.

Both the soil and the weather were favourable to the trials. The shallow ploughing a two-year-old pastured clover ley on mild land chosen. For the deeper work, a field dry on the surface and sufficiently moist underneath was used.

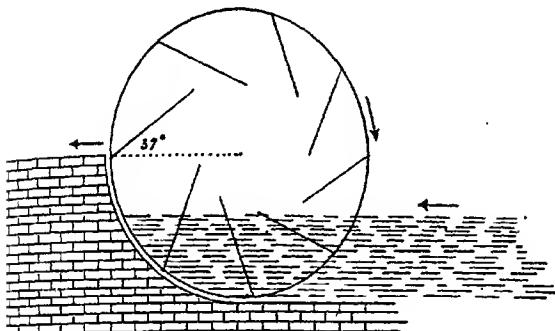
The motor ploughs, thanks to the very favourable soil conditions, as well. As for the amount of work done, only a few trial tests were made with some of the machines. The results are given in the following table:

Motor plough	Quality of soil	Depth of work	Breadth of work	Speed per second	Speed per min.
Ihace	Medium soil	9 $\frac{1}{2}$	7 9	2.85	
Arator	"	—	6 7	3.04	
Stock	"	8	6 7	4.26	
Wede	"	8	5 8	3.11	
"	"	9 $\frac{1}{2}$	5 8	2.98	
"	Heavy clay soil in good condition of moisture.	9 $\frac{3}{4}$	5 8	3.60	

Lastly the writer discusses the quality of the work performed by motor plough.

In Egyptian Water-lift. — PARR, A. E. in *The Agricultural Journal of India*, VIII, Part III, pp. 293-294. Calcutta, July 1913.

A very useful water-lift for low-lift canal irrigation has recently arrived from Egypt. It consists of two circular pieces of iron on about 15 inches apart. These two wheels are connected together

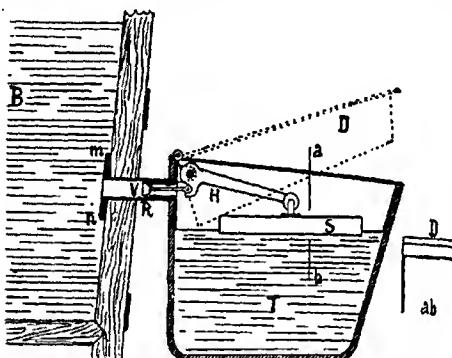


number of vanes set on at an angle of about 37° to the radius, as in the accompanying drawing. The whole thing revolves in a close-fitting magazine. It is geared to run at a slow speed and may be worked by one man. It discharges the water at the height of its own axis." Mr. PARR recommends it as the best machine he has tried for low lift irrigation.

Automatic Drinking Trough (1) for Pigs. — THALMAYER, V. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No 56, p. 647. Vienna, July 12, 1913.

Automatic drinking troughs for pigs are frequently used, especially in Austria. A simple form of such a trough is the one shown in the accompanying drawing. The trough (1) is provided with a cover (D) under which a float is situated. The lever (H) connects the float with the valve (V). When the float rises the float sinks and by means of the lever pushes the valve that the water from the tank or water-pipe (B) can flow into the trough, through the pipe (R); (mn) is a flange.

To the right is a section through the cover along the line (ab). cover (D) is necessary to prevent the animals touching, the flat attached parts with their snouts.



Automatic drinking trough for pigs. Vertical section.

1190 - **A New Apparatus and Method for Milk Sterilization.** - LOSSE, *Molkerei-Zeitung*, Year 27, No. 57, pp. 1105-1106. Hildesheim, July 25, 1913.

As an appendix to an article which has been already mentioned the writer gives a detailed description and diagrams of a complete plant carrying out the new "Biorisator-Process".

The principal part of the "Biorisator" apparatus is the so-called "Biorisator" sterilizer. This consists in the main of two cylindrical receptacles placed one within the other. In the inner the milk is reduced to a fine spray. In the space between the two cylinders, the milk is heated. Steam is conducted along a pipe at the side, in order to obtain the necessary heat for the inner cavity, and for the sterilization process. As secondary apparatus may be mentioned a forcing pump, a compressor and a cooler.

The method of working is as follows (see Plate): The milk in the collector (a) is drawn through the pipe (i) by means of the forcing pump and conveyed by (k) to the compressor (c). The manometer (m) regulates the amount of pressure, and the regulator (d) carries back by the pipe any superfluous milk. The milk is conveyed by the pipe (o) from the compressor to the biorisator and issues through fine orifices into the interior of the latter. After having been reduced to spray, the milk flows from the biorisator (e) through the pipes (r) to the cooler (f) and is here cooled as

pipe (w) and flows to the tank (g). From here it runs to the bottling machine (h), where it is immediately put into bottles.

Before the milk is sterilized, the whole plant is cleaned, either by pumping water through it, or preferably by allowing the water to flow through supply pipe (q) into the biorisator, after closing the milk valve (II) and opening the water valve (III). The necessary heat is obtained by opening steam valve (I) at the same time. The very hot water flows through the plant and sterilizes it. After about 10 minutes, the cooler (f) is attached and the water-valve (III) is opened; all the water is drawn off, the temperature is raised to about 75° C. (167° F.) (the heat required for sterilizing the milk), the pump is set going and the milk valve (II) is opened. The apparatus can now work for hours without stopping and only needs occasional attention.

The product obtained by the Biorisator Process is a pure milk, free from bacteria, with the characteristics of raw milk; it is especially suitable for infants. It is also possible to obtain excellent dairy products from milk, which can be treated just like raw milk. It was also observed in the dairy that there was no evaporation from milk, and consequently no decrease in its amount.

RURAL ECONOMICS.

- Systems of Land Tenure Prevalent in the Plain Belt of the Province of Treviso, Italy. — SACCHI, G. in *L'Agricoltura italiana*, Year 39, Part 749. Pisa, August 31, 1912.

This is a short study of the commonest forms of land tenure in the plain of the Province of Treviso, Italy, which shows how in the same regions there are farms worked by the owners, farms leased and farms held on the *metairie* system. The least frequent form is farming by the owner himself, because, though the estates are prevailingly large or medium sized, the economic unit is the individual farm, varying in extent from 5 to 15 acres. Farms that are managed directly by their owners or their agents are thus the large estates, and chiefly portions of these that are not divided farms, or the small holdings of peasant proprietors. The latter are not numerous, but they tend to increase.

The rent is paid partly in cash and partly in kind: that of the arable land of the farm is given in cash or in kind corresponding to a sum, while the rent of the vineyards and mulberry plantations is given by half of the produce in kind. Frequently a certain number of labour or royalties in kind are included in the rent. This form of tenure prevails on the right of the Piave. The lease is tacitly renewed for a year until either of the parties gives notice to the other between the 1st and the 11th of November. Only the farms belonging to charitable foundations are leased, mostly for periods of nine years, for cash only, or the *half-share* system, though not always so simple as in

Tuscany, prevails on the left of the Piave, where the natural fertility of the soil and the just proportion between the available hands and the area of the farms have been powerful coefficients in the success of this system of tenure, which has led to an advantageous ratio of arable land to plantations of vines, mulberries, etc.

The owner of the land supplies the necessary capital in live stock, he pays one half of the various expenses of production (save labour), the whole of the taxes, and all the cost of new plantations of trees and vines. The expenses caused by the control of fungus pests, as well as the cost of props and wire for the vines, are defrayed in equal shares by the owner and the farmer. The latter, on his side, generally brings into the farm the commonest machines and implements, he provides all the labour and pays house rent, besides giving the owner some royalty in kind and occasionally some days' work and doing some carting for him especially when the latter manages by himself some small portion of the estate.

The rotation and manuring to be used are determined by the owner. The contract is indefinite and it may come to an end any November provided the necessary notice has been given in the previous March.

1192 - Persons engaged in Agriculture in Prussia according to the Census of June 12, 1907. — HAGMANN in *Mitteilungen der Deutschen Landwirtschaftsgesellschaft* Year XXVIII, Part 34, pp. 483-486. Berlin, August 25, 1913.

For the first time, in 1907, the numbers of persons engaged in agriculture have been registered in the returns of professions and exploitation. The comprehensive results of this census are given in Vol. 272, 2b of the Statistics of the German Empire, which has recently appeared. Table I gives the numbers of persons engaged in agriculture divided into five classes according to the sizes of the farms.

TABLE I. — *Persons engaged in agriculture.*

Classes according to size	Men	Women	Total	On 100 ha productive area
Under 5 acres.	747 559	1 846 911	2 594 470	105.0
Between 5 and 12 $\frac{1}{2}$ acres	673 416	824 383	1 497 799	35.5
12 $\frac{1}{2}$ " 50 "	1 273 995	1 244 343	2 518 338	17.5
50 " 250 "	754 476	620 171	1 374 647	8.5
Over 250	602 992	432 278	1 035 270	7.0
For the total area	4 052 438	4 968 086	9 020 524	17.4

Classes of farms according to size:	Number of farms	Number of family engaged			Temporarily engaged		
		Permanently		Foremen and accountants	Permanently engaged		Temporarily engaged
		Temporarily	Permanently		servants	day hands	
a) Absolute figures:							
Under 5 acres.	490 762	540 046	1 265 844	1 818	38 802	20 514	236 634
Between 5 and 12 $\frac{1}{2}$ acres	379 077	543 480	343 162	1 423	47 864	18 244	164 549
" 12 $\frac{1}{2}$ and 50 "	541 810	937 164	339 851	3 785	274 873	52 162	371 663
" 50 and 250 "	172 940	278 799	83 272	8 474	405 293	135 537	299 332
Overt	250	19 363	7 639	3 342	40 627	181 103	459 003
Totals . . .	1 603 982	2 397 128	2 032 471	56 277	947 935	683 460	2 387 371

Classes of farms according to size:	Number of farms	Number of family engaged			Temporarily engaged		
		Permanently		Foremen and accountants	Permanently engaged		Temporarily engaged
Temporarily	Permanently	servants	day hands		servants	day hands	
a and 3							
Under 5 acres.	18.9	20.8	48.8	69.6	0.1	1.5	0.8
Between 5 and 12 $\frac{1}{2}$ acres	25.3	36.3	22.9	59.2	0.1	3.2	1.2
" 12 $\frac{1}{2}$ and 50 "	21.5	37.2	13.4	50.6	0.1	10.9	2.1
" 50 and 250 "	12.6	20.3	6.0	26.3	0.6	29.5	9.9
Overt	2.9	0.7	0.3	1.0	4.0	17.5	44.3
On all the farms . . .	17.8	25.6	22.5	48.1	0.6	10.5	7.6

Classes of farms according to size:	Number of farms	Number of family engaged			Temporarily engaged		
		Permanently		Foremen and accountants	Permanently engaged		Temporarily engaged
Temporarily	Permanently	servants	day hands		servants	day hands	
b) Out of every 100 persons engaged in agriculture the distribution according to size of farms was:							
Under 5 acres.	18.9	20.8	48.8	69.6	0.1	1.5	0.8
Between 5 and 12 $\frac{1}{2}$ acres	25.3	36.3	22.9	59.2	0.1	3.2	1.2
" 12 $\frac{1}{2}$ and 50 "	21.5	37.2	13.4	50.6	0.1	10.9	2.1
" 50 and 250 "	12.6	20.3	6.0	26.3	0.6	29.5	9.9
Overt	2.9	0.7	0.3	1.0	4.0	17.5	44.3
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In this table are included the persons engaged in forest work on agricultural areas, but the results are but insignificantly affected by inclusion.

The preponderance of women in the two classes of smallest are due to the fact that in the small farms the work is for the most part done by the holders themselves with the members of their families, especially women folk (wives, and daughters).

As for the *intensity of the work*, an idea can be gained when the number of persons engaged per area of 100 acres is considered. It appears that number of persons engaged diminishes with the increase of the area of holding. In these figures, however, the real numbers of workers do not agree with exactitude, because in the smaller and middle sized farms there persons returned as present whose work is only partially or not at all due to farming. The real numbers of workers in the classes of the smaller hold are in reality smaller than those returned.

According to the position held in the farms, the statistics distinguish between : *managers, members of the family and labourers*.

The numbers of persons in Prussia on June 11, 1907, belonging to the three groups are shown in Table II.

From the above figures it appears that in the whole State the persons employed in agriculture are to the extent of about two-thirds members of the holders' family and one-third hired labourers. The ratio between members of the holders' family and the strangers varies of course considerably according to the size of the farm. In the smaller-sized holdings holders and the members of their families prevail, namely for the small holdings they are 88.5 per cent., for small farms 84.5 per cent., for middle-sized farms 72.1 per cent. and for large estates a very low per cent. The reverse is the case with hired labour. In the smallest farms it is employed very sparingly, in medium-sized farms it is 27.9 per cent. of total, and in large estates it attains to 97.1 per cent.

Table II shows the character of the agricultural working population. The members of the holders' families are divided into two main groups: those who are permanently employed on the farms and those only temporarily engaged; more than half of the members of families belong to the first group. Their number increases generally with the size of the farm, while the temporarily engaged members are found in the greatest numbers in the smallest holdings. In these, during ordinary periods but a small amount of labour is required, and during the short periods in which there is a great deal of work to be done the members of the holders' families assist. Hired labour is divided into overseers and accountants, permanently (farm servants, maids, and day labourers) and temporarily engaged hands. To the last group belong especially non-resident hands.

The first group is an exceedingly small one. The greatest part is for the permanent labourers, among whom there are more farm servants and maids than day labourers. In each of the classes according to size of farm the distribution of these labourers varies greatly. The proportion of farm servants and maids increases with the size of the farm, but dimin-

ain in the largest farms, in which the greatest contingent is that of day workers.

This distribution of agricultural labour is of the greatest importance for the study of the labour question. The large estates are especially affected by the want of permanent hands. A sufficient number of farm servants and maids is a vital necessity for large estates, for without them the regular work of the farm cannot be carried on. This is seen also from the distribution of permanent and temporary hired labourers. The latter are relatively more numerous in the smaller holdings and diminish with the increase in the size of the farm.

The small holdings are in a position to attract outside labourers during busiest periods of the year, when the assistance of the members of the family is insufficient or not available. For the larger farms a staff of permanent workers is absolutely necessary, because they cannot, like the smaller ones, fill themselves during the busy time of the temporarily disengaged hands.

The work of children, that is persons under the age of fourteen, is, as may be seen from Table III, an important factor.

TABLE III.

	Numbers of children employed	Numbers of children among 100 persons employed in the corresponding class
Members of the farmer's family	permanently	35 531
	temporarily	225 732
Outside labour	permanently	32 150
	temporarily	54 714

Lastly the following average figures for the kingdom of Prussia are given according to the sizes of the farms.

	Percentage of area
Farms under 12.5 acres	12.9
" between 12.5 and 50 acres	27.7
" " 50 " 250 " 	31.3
" " over 250 " " 	28.1

The following figures show the percentage of productive land occupied by various crops:

	per cent.
Cereals	48.4
Forage crops.	25.8
Potatoes and beets.	12.6

The average number of persons engaged on 100 acres of productive land in Prussia is 17.4.

1193 - **The Farmer's Income in the United States.** — SPILLMAN, W. J. in *U.S. Department of Agriculture, Bureau of Plant Industry, Circular No. 132*, pp. 1-12, Washington, July 19, 1913.

The data upon which this article is based are obtained from the census of 1910, combined with certain factors worked out in the experience of the Office of Farm Management in conducting farm management surveys.

There are two items of income about which no information is available, *viz.* the value of the milk and cream consumed on the farm, and what the farmer earns for work outside his farm; and one item of expenditure which cannot be determined, *viz.* the amount paid for live stock. The data presented in the accompanying table should be interpreted in the light of these omissions.

The average area of the American farm in 1910 was 138.1 acres, 100 acres of which are classed as improved land and 49.77 acres as devoted to crops. The total average investment per farm is \$6,443.67, the amount in farm buildings being \$994.33 and that in implements and machinery \$198.88.

All the data for the receipts as given in the table were obtained from census returns. The farm is also credited with the total value of all crops produced except that part fed to live stock, which is obtained by deducting the value of forage sold from the total value of the forage on the farm. The farm is thus credited with the butter, cheese, eggs, poultry, hot meat, fruits, vegetables, bread, etc., consumed on the farm where it is produced, and the value thus consumed on the farm is included in the income.

Any revenue from outside sources should be added to the net income given in Table I.

The expenses for labour, fertilisers and fodder are obtained from census returns also. The cost of maintenance of farm buildings is placed at 5 per cent. of their value, and that of implements and machinery (including repairs) at 20 per cent. of their cash value, both figures being based on extensive investigations by the Office of Farm Management, and agree with the estimates in Warren's "Farm Management". Taxes are assumed to be 0.6 per cent. as an average for the whole country.

The remaining items of expense in the conduct of a farm are collectively calculated as 15 per cent. of other expenditure, which is the average obtained from a number of farm management surveys conducted by the Office of Farm Management. The total farm expenses, omitting the cost of live stock purchased, amount to \$340.15.

The farm income is obtained by deducting the total expenses from total receipts, and amounts to \$640.40. Assuming 5 per cent. as the rate of interest to which the farm investment (of \$6,443.67) is entitled, the income is then distributed between interest and labour income as follows: Interest on investment, \$322.18; labour income \$318.22.

The average farm mortgage based on the number of all farms, is \$1,029.00, which at 6 per cent. per annum amounts to \$102.90. Deducting this amount from the farm income of \$640.40 we get \$537.50 (to which must

TABLE. — *Labour income of farmers in the United States.*

Item	Total	Amount per farm
Number of farms	6 361 502	—
Cultivated land acres.	478 451 750	75.2
Net farm investment	\$ 40 991 449 090	\$ 6 443.67
Investment in farm buildings	\$ 6 325 451 528	\$ 994.33
Investment in implements and machinery	\$ 1 265 149 783	\$ 198.88
<i>Receipts.</i>		
<i>Products (excluding milk and cream used at home)</i>		
Butter	596 413 463	\$ 93.75
Oil	65 474 328	10.29
Milk	901 597	0.14
Meat produced	306 688 960	48.21
Meat raised	2 025 506 272	31.83
Honey and wax	5 992 083	0.94
Meat animals sold	1 562 936 694	245.69
Pesticide animals slaughtered	270 238 793	42.48
<i>Value of all crops</i>	\$ 5 487 161 223	
<i>Value of crops</i>	1 438 583 919	
<i>Value of crops for feeding</i>	414 697 422	
<i>Value of crops sold</i>	92 458 571	
<i>Other expenses</i>	824 004 877	
<i>Value of crops fed</i>	2 260 461 267	
<i>Value of crops</i>	3 226 699 956	507.22
<i>Total gross farm income</i>	6 237 850 146	\$ 980.55
<i>Expenses.</i>		
<i>Wages</i>	\$ 651 611 287	\$ 102.43
<i>Interest</i>	114 882 541	18.06
Maintenance of buildings (at 5 %)	299 839 857	47.13
Maintenance of implements and machinery (20 %)	316 272 576	49.72
<i>Interest on 6 %</i>	253 029 956	39.78
<i>Interest on 5 %</i>	245 947 694	38.66
<i>Total</i>	1 881 584 911	295.78
<i>Miscellaneous expenses (15 % of other expenses)</i>	282 237 736	44.37
<i>Total expenses</i>	2 163 822 647	340.15
<i>Summary.</i>		
<i>Gross income</i>	\$ 6 237 850 146	\$ 980.55
<i>Expenses</i>	2 163 822 647	340.15
<i>Net farm income</i>	4 074 027 499	640.40
<i>Interest on investment (at 5 %)</i>	2 049 572 454	322.18
<i>Labour income</i>	2 024 455 045	318.22
<i>Interest on mortgage (\$ 1 715 at 6 %)</i>		102.90
<i>Expenses for purchase of live stock and for family living</i>		537.50

added the value of milk and cream consumed on the farm and any out income) as the sum to be used in the purchase of live stock, in living expen and in savings.

As the majority of farmers are capitalists, the interest on capital constitutes part of the income and the labour income is undoubtedly smaller it would be if the farmer did not also have the interest on his capital. T we find that in the better agricultural sections, the labour income of ten is considerably higher than that of farmers who work their own fa though the latter may have larger total incomes than the tenants. fact a large number of American farmers live on the interest of their investment and do not receive anything for their own wages. But this is possible on the small farm, where the interest is too small to adm high standard of living, and the farmer must have some labour inc in addition.

In America it is reasonable to infer that at least half the farm fam of the country have incomes smaller than those given in Table I. In dual farmers here and there have larger incomes than this average, but facts presented in the table indicate that on the whole the income of fam in this country, even when we include as a part of the income those consumed on the farm where they are produced, is certainly not more sufficient to pay 5 per cent. on the investment and ordinary farm wage the labour they do, and it is probably considerably less than this.

1894 - Notes on Tobacco-Growing in Germany. — LANG, H. Einiges aus dem C der deutschen Tabakstatistik. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Pa. 409-426. Stuttgart, June 13, 1913.

The number of German tobacco-growers has much decreased du the last 20 years, for while in the five years 1891-1895 there were 151 390 sons growing this crop in the district under the jurisdiction of the Ger Customs, the figures for the subsequent periods of five years were as fol

1896-1900 : 136 352
1901-1905 : 108 666
1906-1910 : 95 369

The tobacco growers have thus progressively decreased in the proportion 100 : 90.1 : 71.7 : 62.9. The following table gives the details of decrease in the principal tobacco-producing districts of Germany:

Years	Prussia				Baden				Bavaria		Alsace-Lorraine
	Number of planters	In % of the total number of the Empire	In % of the first 5 years period	Number of planters	In % of the total number of the Empire	In % of the first 5 years period	Number of planters	In % of the total number of the Empire	In % of the first 5 years period	Number of planters	
1891-1895	82 962	54.8	100	37 469	24.8	100	100	100	100	100	
1896-1900	68 444	50.2	82.5	39 125	28.7	104.4	91.4	89.2			
1901-1905	49 445	45.5	59.6	34 694	31.9	92.6	83.0	71.7			
1906-1910	37 582	39.5	45.3	34 316	36.0	91.6	79.9	64.9			

he area cultivated by each tobacco-grower has, however, considerably increased, and consequently the total area under tobacco has decreased in proportion very different from that in which the number of cultivators has decreased. The cultivated area was as follows:

1891-1895	43 021	acres
1896-1900	44 748	"
1901-1905	39 908	"
1906-1910	37 647	"

The decrease occurred in the following proportion 100 : 104.0 : 92.7: The increase or decrease of the area under tobacco in the various districts is shown by the following table.

TABLE II.

Years	In % of the total under tobacco in the Empire		In % of the area under tobacco in the different districts during the first five years.						
	Prussia	Baden	Prussia	Baden	Bavaria	Alaace-Lorraine	Wurttemburg	Hesse	
1895	29.2	39.9	100	100	100	100	100	100	100
1900	29.8	41.2	106.3	107.5	94.8	102.0	105.5	95.7	
1905	29.1	41.0	92.6	95.4	88.8	96.4	86.5	83.4	
1910	25.8	43.3	77.3	95.0	85.5	101.7	85.8	83.8	

In consequence of the decrease in the area under tobacco, and owing to the fact that the yield per acre has rather diminished than increased, the production of tobacco, after a temporary rise in the second five-year period, fell considerably in the two succeeding five-year periods, as is shown by the following figures:

	Amount of tobacco gathered (dry)	
	Absolute amount	Relative amount in % of the first five-year period
1891-1895	722 707	100
1896-1900	742 320	102.9
1901-1905	695 382	96.2
1906-1910	599 049	82.9

The proportions for the various States are given in Table III.

TABLE III.

	Prussia	Baden	Bavaria	Alsace-Lor.
1891-1895	100	100	100	100
1896-1900	96.8	109.0	98.1	104
1901-1905	90.2	100.8	95.5	100
1906-1910	74.0	86.7	83.8	97

While the production decreases, the price of tobacco rises, and as latter movement is relatively stronger than the former, the result is an increase in the total value of the crops.

TABLE IV.

	Total value of annual tobacco crop in Germany £	General movement	Increase and decrease in the various State				
			Prussia	Baden	Bavaria	Alsace- Lorraine	Wurtem- burg
1891-1895 . . .	1 434 097	100	100	100	100	100	100
1896-1900 . . .	1 484 798	103.5	94.4	112.2	101.8	103.0	99.5
1901-1905 . . .	1 436 863	100.1	90.7	105.0	103.2	109.7	90.1
1906-1910 . . .	1 536 658	107.1	92.2	112.8	114.2	129.3	109.3

The average crop per surface unit has, on the whole, remained the same ; it was as follows per acre throughout the Empire :

1901-1905	16.81	cwt.
1906-1900	16.61	"
1901-1905	17.44	"
1906-1910	15.93	"

Great variations have been found in the yield per acre in different districts. If the average crop in each period of five years is taken at 100, the yield per acre is as given in Table V.

TABLE V.

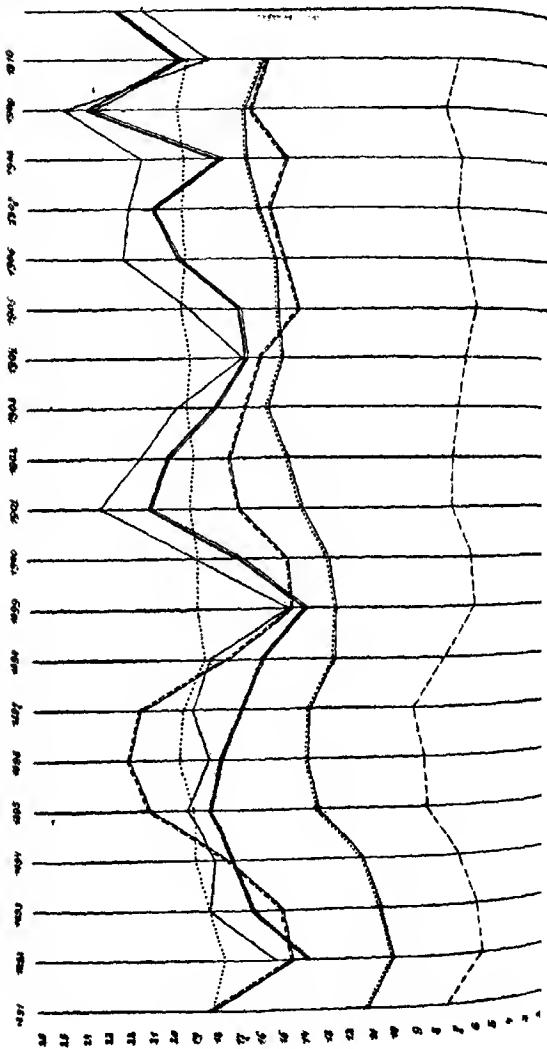
	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1895 . . .	96.9	102.3	as a rule from 6 to 10 % below the average for the Empire	102.3	124.4	80.2
1900 . . .	90.3	105.6		104.9	128.7	79.5
1905 . . .	91.1	104.6		107.1	126.8	84.4
1910 . . .	98.6	99.5		109.4	127.2	77.0

The average price of tobacco has risen throughout the Empire during four five-year periods to 39s 8d, 40s, 41s 3d, and 51s 3d respectively. It thus increased proportionately from 100 to 100.9, 104.1 and 129.1: money return per acre has also notably increased. It rose from £33 7s in the first five-year period, and £33 3s 9d in the second, to £36 0s 6d and £36 6d in the two last periods. The proportion is thus 100 : 99.5 : 9 : 122.3. Nevertheless, the different States have taken very unequal parts in this development, as is shown by Table VI.

TABLE VI. — *Value of the crop per surface unit in % of the value of first five-year period.*

	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1-1895 . . .	100	100	100	100	100	100
6-1900 . . .	88.7	104.2	107.3	94.3	101.0	100.3
11-1905 . . .	97.8	110.0	116.5	111.9	113.6	123.0
6-1910 . . .	119.1	118.7	133.7	127.1	127.0	133.1

The value of the tobacco produced per surface unit varies much from year to another; these fluctuations not only cause uncertainty and anxiety to the growers, but have a considerable influence upon the general welfare of the planters. After some good seasons, the area under tobacco once increases, not only because new cultivators add fresh plantations to those already existing, but also from an extension of the former tobacco-fields. On the other hand, after some bad seasons, not only do many planters abandon the undertaking, but those who remain faithful to the industry reduce the area under cultivation. The writer gives a graphic representa-



of this movement in the German Empire and the Grand Duchy of Baden (The double lines refer to the former, and the single lines to the latter). The graphic curve gives the amount realized each year by the tobacco yield per hectare (2.47 acres): the figures at the extreme left each represent marks (about £5). The two curves referring to the Empire and the Grand Duchy of Baden (continuous lines) are displaced by a column—that is say by a year—towards the right. This is done in order to show more clearly that the crop obtained one year has an undoubted effect upon the crop placed under tobacco the next year, and that this occurs with the utmost regularity. As for the area under tobacco in any given year (broken lines), the figures on the extreme left each represent 1000 ha. (2470 acres), and in the case of the figures relating to the area cultivated by each planter (solid lines), every figure represents one acre (4 rods).

AGRICULTURAL INDUSTRIES.

- A Practical Formula for the Calculation of the Solids not Fat in Milk. —
HÖRER, M. H. in *Zeitschrift für Fleisch- und Milch-hygiene*, Year 23, Part 23, pp. 139-141. Berlin, September 1, 1913.

The formula given by the writer is based upon the same principle as that of Bertschinger, viz.:

$$\text{Solids not fat} = \frac{\text{degree of lactosimeter} + \text{percentage of fat}}{4}$$

If, for instance, the specific gravity of the milk is 1.034 and the fat content 2.8 per cent, the solids not fat = $\frac{34.0 + 2.8}{4} = 9.2$.

This formula has the advantages of being simple and accurate, and of giving quick results.

Also, as is seen by the experimental data reproduced in Tables I, II, III (1), it is superior to Ackermann's automatic calculator, and especially adapted for testing doubtful milk.

(1) The Tables 1 and 2 are reproduced in a slightly abridged form.

TABLE I. — *Results obtained from samples of doubtful milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according to Arkeman and calculated
1	1.0270	2.38	7.34	7.34	7.47
3	1.0300	2.70	8.07	8.17	8.30
4	1.0257	3.00	7.11	7.17	7.27
6	1.0312	2.24	8.43	8.36	8.49
8	1.0326	2.02	8.68	8.65	8.83
9	1.0293	3.08	8.05	8.09	8.20
11	1.0257	2.71	7.25	7.10	7.21
12	1.0275	2.79	7.41	7.57	7.68
14	1.0295	2.21	8.02	7.92	8.06
16	1.0268	2.66	7.17	7.36	7.48
17	1.0308	2.26	8.41	8.26	8.39
19	1.0287	2.38	7.34	7.77	7.90
20	1.0292	2.64	7.79	7.96	8.08
22	1.0296	2.40	7.83	8.00	8.13
24	1.0292	2.16	7.63	7.84	7.98

TABLE II. — *Results obtained from samples of normal milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according to Arkeman and calculated
1	1.0330	3.44	9.12	9.11	9.19
3	1.0320	4.14	9.06	9.03	9.07
4	1.0315	4.19	8.96	8.92	8.96
6	1.0330	3.04	9.06	9.01	9.11
7	1.0320	3.23	8.77	8.80	8.91
9	1.0310	3.27	8.47	8.56	8.71
11	1.0315	3.21	8.83	8.67	8.74
12	1.0325	3.38	9.10	8.97	8.77
14	1.0315	3.21	8.83	8.67	8.83
15	1.0320	2.97	8.98	8.74	8.90
16	1.0320	3.14	9.02	8.78	8.95
17	1.0320	3.00	9.02	8.75	8.91
18	1.0320	3.22	8.51	8.80	8.65
20	1.0320	3.51	8.59	8.87	8.87

TABLE III. — *Results obtained with samples of half milk.*

Milk No.	Specific gravity	Fat — %	Quantity of solids not fat	
			according to chemical analysis	according to the new formula
1	1.0288	0.89	7.45	7.41
2	1.0342	0.91	8.72	8.77
3	1.0340	0.97	8.35	8.74
4	1.0262	0.88	6.66	6.67
5	1.0292	0.94	7.58	7.53
6	1.0349	0.90	8.91	8.95
7	1.0362	1.05	9.11	9.31

- The Specific Gravity of Cow's Milk and the Change it Undergoes Shortly After Milking. — FLEISCHMANN and WIEGNER in *Journal für Landwirtschaft*, Vol. 61, Part 3, pp. 283-323. Berlin, July 21, 1913.

Quévenne, the inventor of the lactodensimeter, had already observed in the course of the first 4 to 6 hours subsequent to milking, the specific gravity of cow's milk increased on the average 0.0008 to 0.0015, when as kept at a temperature below 30°C. Opinions have hitherto been divided as to the causes of this property possessed by milk. Quévenne and later Reiss and Sommerfeld, thought that this increase in specific gravity occurred through the volatilization, immediately after milking, of gases present in solution in the milk. Bouchardat considered the increase in specific gravity to be due to a molecular change in the structure of sugar of milk. Other investigators attributed the phenomenon to a rise movement of the fat globules. Recknagel, Kirchner and Fleischmann considered that the casein globules expanded further. Lately, the alteration in the volume of the fat globules has often been cited as the cause of change in the specific gravity of milk. So far, however, the literature dealing with the subject has furnished no reliable data based on accurate investigations.

The writers have subjected to rigorous examination all the accounts of the experiments hitherto made to elucidate this circumstance, and to the end have themselves carried out exhaustive investigations in the Laboratory of Milk Chemistry at the Göttingen University. The results prove that the hypothesis of gas volatilization does not explain the phenomenon. Alteration in the milk sugar or movement of the globules, such as could cause the specific gravity, was observed. No support was found for the theory of the expansion of the casein globules which was put forward by Recknagel. The writers, however, observed the existence of a certain inter-

relation between increased specific gravity and the presence of fat globules. When, for instance, the milk was kept for 22 hours at the same temperature as at the moment of milking, no increase in specific gravity was noticed. The specific gravity of milk which had been recently milked and then cooled down to 3°C., increased 0.0013; on the milk being subsequently warmed up to 45°C., the specific gravity sank to what it was before. Skimmed milk did not increase in specific gravity even after a longer time or after having been cooled to a lower temperature. The larger the fat content, the higher the increase in specific gravity if the milk was kept below the melting point of the butter fat. Kept at body heat, milk with a high or with a low fat content underwent no change in its specific gravity. Solidified butter fat possesses a higher specific gravity than liquid butter fat. The specific gravity of emulsions of fat and water is less than that of the fat.

The temperature oscillations of the milk globules were produced with the same rapidity as those of the milk plasma. The writers have come to the conclusion, as a result of their researches, that the increase in specific gravity which occurs in the case of milk which has recently been milked, is due to the coagulation of the fat globules present.

1197 - *Practical Methods for the Determination of Fat in Cheeses. Comparison of the Methods in Use, with Special Regard to the New Processes of Kooper and Wendler.* — HERRMANN, H. in *Molkerei-Zeitung*, Year 27, No. 54, pp. 1054. Hildesheim, July 16, 1913.

The writer speaks of the methods most usually employed for the determination of the fat in cheese, *viz.* those of Siegfeld and Gerber; he compares them with Kooper and Wendler's methods and gives the results of comparative experiments, comparing the data thus obtained with the results of Bondzinski-Radzlaff method. He thus shows, that for the analysis of cheese rich in fatty matter, the Siegfeld method and those of Kooper and Wendler are as suitable, and give almost as accurate results, as the Bondzinski-Radzlaff process. The Kooper method is the one most adapted for the estimation of fatty matter in cheeses which are poor in fat.

1198 - *The Consumption of Meat and Milk in Japan in 1911.* — *The Annual Report of the Central Sanitary Bureau of the Imperial Japanese Government for the 41st Year of Meiji* (1912), pp. III + 73 + 172 + 106. Tokyo, 1913.

The number of slaughter-houses existing at the end of 1911 was 49, of which 219 were public, and 276 private. The number of animals slaughtered is given in Table I:

The average annual consumption of meat per inhabitant in 1911 was 2.74 lbs.

The number of animals prohibited to be slaughtered after examination was 460 bullocks, 46 calves, 54 pigs and 316 horses. The number of animals ordered to be entirely thrown away after slaughtering was 193 bullocks, 6 calves, 47 pigs and 17 horses, while that of those of which only parts were thrown away was 5165 bullocks, 92 calves, 2296 pigs and 1181 horses. Besides these there were some cases where the viscera only were ordered to be thrown away.

TABLE I.

	No. of animals slaughtered	Weight of meat — Rb.	Average weight of meat per animal — Rb.
			— Rb.
cts.	262 588	97 640 000	374.84
s.	21 858	2 395 600	109.60
and goats	2 488	24 350	25.73
.....	198 423	23 415 500	118.01
es.	66 555	16 527 500	248.33

At the end of 1911, there were in Japan 5691 dairy-farms; these produced during the year 10 113 000 gallons of milk, which corresponds to a annual consumption per head of 1 $\frac{1}{2}$ pint. Compared with the previous year, there was an increase of 2.6 per cent. in the number of dairies, of 9.8 per cent. in the production of cow's milk. The prefectures of Ito, Tottori, and Kagoshima produced 7 460 gallons of goat's milk, that four times as much as in the preceding year. There were 47 condensed milk factories, which turned out 1 480 000 lbs.

Table II gives the amount of milk and of condensed milk produced in chief dairy prefectures.

Prefecture	Milk — galls	Condensed milk — lb.
yo.	1 748 000	70 250
ts.	635 000	17 930
go.	432 700	2,740
mu.	241 900	156 250
ba.	110 900	273 850
id.	491 100	—
oku.	331 800	663 800
maguchi.	163 550	122 500
tsudo.	461 400	131 500

1199 - Annual Wool Review for Australasia. — *Dalgety's Review (Australasian Wool Number 1913, p. 83. Sydney, July 1, 1913.*

The total quantity of wool of Australasia exported has been 2 247 3 bales or 721 821 516 lbs., as against 2 537 867 bales or 840 694 748 lbs. in 1911-12. To arrive at the actual production it is necessary to add the amount of wool used by manufacturers in Australasia, namely, 87 775 bales or 28 175 775 lbs. The result shows the actual production of wool for the twelve months to have been 2 335 040 bales or 749 997 291 lbs., as against 2 637 127 bales or 873 549 808 lbs. in 1911-12.

The average weight per bale of the past clip as dealt with in Australasian markets is 321.2 lbs., as against 331.2 lbs. for the previous year, 332.1 lbs. for 1910-11, 335.5 lbs. in 1909-10, 330.6 lbs. in 1908-9, 333.7 lbs. in 1907-8, and 339.7 lbs. in 1906-7.

It will be seen that the decreased average weight of the bales during the past wool year has been 10 lbs., whilst compared with six years ago the increase in weight is no less than 19.7 lbs.

Sheep numbers as at the close of the year show the very serious fall off of 9 809 634 head, as compared with the same point twelve months ago, and it will take a succession of good seasons to regain the lost ground. Details as to the number for each State compared with those returned at the end of the two preceding years are shown in Table I.

TABLE I.

States	1912	1911	1910
New South Wales	39 436 118	45 032 022	45 823 3
Victoria	11 892 224	13 857 804	12 937 5
Queensland	20 248 580	20 387 838	20 153 1
South Australia	5 481 487	6 267 477	6 432 1
West Australia	4 593 458	5 408 583	5 157 1
Tasmania	1 800 000	1 788 310	1 735 1
Commonwealth	83 451 867	92 742 034	92 247 1
New Zealand	23 750 153	24 269 620	23 792 1
Australasia	107 202 020	117 011 654	116 034 1

The average price per bale realised for the 1 804 801 bales sold in Australasian markets has been £13 13s 1d, which compares with £11 11s 1d in

11-12, £ 12 10s 4d in 1910-11, £ 13 12s 2d in 1909-10, and £ 12 9s od for last thirteen years.

The value of the clip sold in Australasia during the past year has risen to £ 24 642 643, whereas during the previous year 1 926 926 bales had £ 22 682 090, and in 1910-11 the 1 865 167 bales sold realised £ 6 602. The average number of bales sold in the Australasian markets during the past seven years has been 1 719 066, and the average realisation £ 6 002 per annum.

The past clip was composed of 69 per cent. merino, and 31 per cent. crossbred, a slight increase in the proportion of crossbred as compared with previous year, when the respective proportions were 72 and 28 per cent. The clip of 1910-11 was composed of 76 per cent. merino, and 24 per cent. crossbred, while in 1908-9 there was 78 per cent. of merino and 22 per cent. of crossbred.

The comparative failure of the 1912 lambing is revealed by the quantity of lambs' wool sold in Australasia during the past twelve months, which amounted to 63 106 bales, as compared with 93 050 bales for the preceding year, 98 314 bales for 1910-11, 108 808 bales in 1909-10, 69 456 bales in 1908-9, and 70 980 bales in 1907-8. The proportion of lambs' to fleece was 1 cent., as compared with 5 per cent. for the two preceding years, and 1 cent., 4 per cent., 5 per cent., and 7 per cent. respectively for the years before that date.

The quantity of scoured wool sold in Australasian markets has been 11 bales, or 8 per cent. of the total wool sold, which compares with 16 bales, or 7 per cent., in 1911-12; 160 326 bales, or 9 per cent., in 1910-11; 195 241 bales, or 10 per cent., in 1909-10; and 177 877 bales, or 11 per cent., in 1908-9.

† **Experimental Contributions on the Subject of the Disinfection of Hides and Fleeces containing Anthrax Spores.** — Ševcik in *Zeitschrift für Infektionskrankheiten, Parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 6, pp. 322-328; Part 7, pp. 429-452. Berlin, June and July 1913.

An account of culture experiments and experiments on animals undertaken for the purpose of testing the methods adopted by Seymour-Jones and Chattenfroth for the disinfection of hides and fleeces containing anthrax.

It was shown that a 0.02 per cent. solution of sublimate, as recommended by Seymour-Jones for dried sheep-skins and large hides, is unreliable and that ox-hides, even if placed in a solution of sublimate ten times strong and left there for 48 hours, are not necessarily free from infection. Chattenfroth's method was perfectly satisfactory for the sterilization of marmoset and rabbit skins, but was not efficacious in the case of ox-hides and grease-free sheep-skins. On account of its cheapness and the small amount of danger it entails, this system is to be recommended for the sterilization of small skins.

1201 - Notes on the Vine-Growing Districts of Chile (1). CANU, G. (Dirigé
the Oenological Station of Chile) in *Annales de la Science Agronomique*, Vol.
No. 5, pp. 351-365. Paris, May 1913.

Vine-growing is one of the most ancient and most important industries of Chile.

Conditions of vine-cultivation. — A large portion of Chile lies between the 30th and 38th degrees of south latitude which delimit the area which is essentially suitable to vine cultivation. This area is bounded on the east by the Andes, while on the west, the temperature is regulated by the presence of the Pacific Ocean. This vast zone enjoys an exceptional climate and is free from hail storms. The rainy season coincides with the winter; the long summer is hot and dry, spring frosts are rare, and cryptogamic diseases infrequent. *Oidium* exists, but though sulphur dustings are carelessly carried out, this fungus does little harm. Mildew is practically non-existent. On the other hand, anthracnose has made its appearance in several departments. Further, *Conchylis ambiguella*, *Halicta amplexella*, *Eudemis (Polychrosis) botrana* and *Oenophitira pilleriana* are unknown in Chile, though other parasites exist there, such as *Phytophthora vitis*, *Tachys* sp., *Tylenchus* sp. and even *Margarodes viticium*. To all the advantages Chile possesses should be added a plentiful supply of water, at least in the valleys where most of the vineyards are situated. The streams descending in large numbers from the Andes permit of the systematic irrigation of the vines according to the requirements of the different vineyards.

Methods of vine-growing and wine-making. — These vary according to the several zones. If the old vines of the country, owing to their planting, do not receive all the attention they require, the new vines, which are planted in lines and supported by iron wire, are, as a rule, carefully tended as regards the cleanliness of the soil, and are systematically pruned. Further, while the cellars belonging to the old Spanish vineyards are nearly all badly constructed and provided with very primitive furniture, those properties are numerous where the cellars are carefully made and furnished with all the appliances which are requisite for handling the grapes and for subsequent work in the cellar.

The Wine-making Station of Chile has greatly contributed to the improvement of the methods of work, by its critical studies of the wines, its repeated advice, and by the publication of numerous instalment plans. Further, by means of lectures held on the spot in the different growing regions, and an incessant propaganda, it encourages and promotes industrial methods of wine-making.

Chilian wines — From certain French vines, viz. Cabernet, Merlot, Cot, Verdot, there are produced in the neighbourhood of Santiago, especially in the "Llano de Maipo" and the "Llano Subercaseux", full-bodied wines, of relatively good quality and bouquet, which resemble Bordeaux.

(1) See No. 1638, B. Dec. 1912.

ork up fairly quickly, but improve little on keeping. From Pinot-noir gathered before it is over-ripe, and treated with care, relatively light are produced; these are good in quality and have a delicate flavour, hat resembling Burgundies.

reaking generally, in the same zone, the white wines are inferior to the Sémillon, in particular, is nearly always deficient in mellow ness. other hand, some cellars produce from Pinot-blanc a very mellow with a pleasant bouquet. Some experiments should be mentioned were made with wines resembling certain types of Sauternais. By t was proved that with a little method and perseverance it is possible ain wines possessing bouquet and preserving a certain amount of

The following table gives the analyses of wines made from differ- nes, for the purpose of determining a few of the chemical characteris- these products. The wines analysed were new, as a rule.

TABLE I. — *Wines from the neighbourhood of Santiago.*

composition	Cabernet	Pinot	Merlot	Verdot	Romane	Sémillon	Sauvignon	Pinot blanc	Folle blanche
percent, in vol.	995.2	995.4	994.7	994.8	995.6	992.0	992.0	991.4	995.8
at 100°, per 1000	11.8	12.5	12.2	11.0	12.4	12.1	10.9	12.0	10.4
substances in lit per 1000 . .	24.34	26.12	22.18	17.44	26.66	16.68	12.2	13.04	21.00
in Potassium ates, per 1000 . .	2.17	2.47	2.17	1.92	2.97	1.92	0.78	1.43	1.78
in Tartaric ates, per 1000 . .	0.55	0.54	0.39	0.33	0.37	0.40	0.32	0.37	0.59
Acidity in H ₂ SO ₄ 000	3.06	2.46	3.13	3.57	3.81	2.53	3.13	1.78	3.96
Matters p. 1000 . .	2.42	2.56	2.82	1.96	1.44	1.50	1.36	1.48	2.04
Acidity in H ₂ SO ₄ 000	2.94	4.13	3.80	4.04	4.86	4.74	4.09	3.76	5.45
Acidity, in O ₂ per 1000 . .	0.31	0.49	0.30	0.39	0.40	0.34	0.74	0.82	0.67

another important vine-growing zone is that of "Lontué" and "La." The crops are often larger than those in the neighbourhood of Igo, especially in the first of the above localities. The wines are less silic and poorer in dry extract; they are also inferior in quality. Table I contains some types of analyses of the wines of this district.

TABLE II. — *Lontué Wines.*

	Cabernet	Pinot	Cot	Merlot	Sémillon
Density ²⁰	944.5	993.4	994.3	995.4	993.0
Alcohol per cent. in vol.	11.8	11.9	11.2	11.2	12.7
Extract at 100°, per 1000	21.12	16.78	20.34	22.90	19.40
Reducing substances, in glucose per 1000	1.66	1.85	1.47	0.78	2.25
Sulphates, in potassium sulphate per 1000	0.35	0.34	0.30	0.49	0.33
Cream of tartar per 1000	3.65	2.61	3.21	3.43	2.53
Mineral substances per 1000	2.30	2.04	2.42	2.70	1.24
Total acidity, in H_2SO_4 per 1000.	3.92	3.19	3.35	4.53	4.11
Volatile acidity, in $C_2H_4O_2$ per 1000	0.41	0.32	0.35	0.79	0.30

TABLE III. — *Wines of the Coast Cordilleras.*

	Red wines of the country				White wines of the	
	Provinces of			Sémillon	Provinces	
	Linares	Maulés	Concepción		Linares	Maulés
Density	995.2	997.5	996.1	991.2	993.0	996.4
Alcohol per cent. in vol.	10.9	12.2	9.2	11.4	11.8	10.3
Dry extract at 100°, per 1000. .	19.74	28.68	17.84	23.35	14.50	21.0
Reducing substances, in glucose per 1000	1.41	4.34	1.85	1.07	1.78	1.8
Sulphates, in potassium sulphate per 1000	0.45	0.31	0.24	0.22	0.20	0.2
Potassium bitartrate per 1000 . .	4.03	4.40	2.33	2.68	2.91	3.2
Mineral substances per 1000	2.80	3.12	2.92	1.40	1.92	2.4
Total acidity, in H_2SO_4 per 1000 . .	3.68	3.56	2.21	3.60	3.35	4.0
Volatile acidity, in $C_2H_4O_2$ per 1000	0.54	0.56	0.85	0.47	0.74	0.5

he district producing inferior wines is chiefly that known as the Coast lera, which includes the provinces of Linares, Macule and Concepcion. ally it is the hill slopes that are planted with vines ; these vineyards watered, as the rainy season in this part is prolonged till sufficiently to the spring. French vines are here relatively rare, the old Spanish es being still cultivated. They yield larger crops than the French but the wines made from their grapes are flat, without freshness or et. Table III gives some examples of the composition of these wines, amles were taken from new wines before the first racking.

Specialities. — To the north of Santiago, in the Provinces of Aconcagua and Coquimbo, the crop is used for the elaboration of special products "chichas", liqueurs, raisins and brandy. "Chicha" is an exclusively Chilean product ; it is grape-juice concentrated at 12°, 13° and 14° by being placed over an open fire out of doors, and then left to ferment spontaneously. This agreeable beverage is sold when it sparkles ly and has lost some of its sweetness, but has not yet acquired a high alcohol content. "Chicha" is made throughout Chile, but this northern with its different grapes (Alexandrian Muscats, white, yellow, rose, n, and other Muscats; Torontes, etc.) produces a kind which is especially prized.

TABLE IV. — *Composition of Chichas.*

	Santiago	Buin	Naucagua	Cauquenes	La Calera
g.	1036.4	1057.5	1027.6	1040.0	1080.0
per cent. in vol.	7.2	6.5	9.0	10.1	3.0
turcit at 100°, per 1000 . . .	114.30	—	—	179.90	217.80
ing substances, in glucose 1000	95.6	117.60	84.4	171.00	207.00
per 1000.	53.7	87.37	64.35	93.60	127.90
ce per 1000.	41.9	30.23	20.05	77.40	79.10
ll substances per 1000 . . .	2.24	2.32	2.10	2.06	7.62
of tartar per 1000.	3.13	4.12	3.73	4.78	6.51
ic acid per 1000.	0.85	1.29	0.96	0.72	1.93
acidity, in $H_2S O_4$ per 1000	3.84	4.28	4.21	4.82	5.46

The sweet wines and liqueur-wines produced in the Province of quimbo are not without their good qualities. Aromatic brandies as "piscos" are also made in this district.

Raisins. — In Huasco and Elqui, raisins are made from Alexia Muscats grown on trellises on the slopes at an altitude of from 33 500 ft. The climate there is particularly dry and warm. The grapes gathered when fully ripe. They are hung up in special rooms, where dry by the action of the natural circulation of the air. In two months the grapes are dry; they are then passed through boiling water for two minutes, and are subsequently drained, dried and packed.

Area under wines, and vine production. — The area planted in may be estimated at 250 000 acres; the vineyards are nearly equal divided into irrigated and non-irrigated plantations. The so-called vines occupy a surface of 160 500 acres, as against 56 500 acres planted French varieties. The average production is about 154 million gallons the whole number of vineyards.

Consumption and exportation. — At the present time, the Chilean are mostly consumed in the country. But it is interesting to note that there is also a considerable exportation of liqueur wines to Germany, of a good brand are those chiefly exported to Uruguay, Argentina, Bolivia and Brazil.

The value of the vines. — The value of the vineyards per acre, in irrigated zones, amounts as a rule to from £80 to £128 according to the district, the quality of the soil, distance from the railway, etc. In non-irrigated zones, the value varies between £16 and £32.

1202 - *The Wines of Tokay and a Comparison with those of Sauternes.* — ^{La} in *Revue de Viticulture*, Year 20, Vol. XL, No. 1024, pp. 129-135. Paris, July

The temperate district of Tokay-Hegyalja, in Hungary, is noted for very excellent liqueur wine prepared from more or less shrivelled grapes not attacked by *Botrytis cinerea* ("Edelfäulniss" (1).

Producing district. — The district of Tokay-Hegyalja, the Côte of Hungary, is situated in the North-East of the kingdom in the County of Zemplén, comprising some 30 communes including those of Tokay; it must be added one commune in the County of Abanj-Torna thus 31 communes.

Tokay-Hegyalja is a range of hills extending from the extremity of the great plain of Hungary some distance from the Carpathians, for 12 miles, and containing an area of 12 450 acres of land occupied by cultivators.

The total production of this area averages about 1 760 000 gallons and occasionally reaches 2 640 000 gallons. Of this total only about one third reaches the high quality required for export, and of the export wine 95 to 98 per cent. is of the Szamorodni or Maslás brand; the

(1) See No. 418 B. April 1913.

akes up the remaining 2 to 5 per cent., the real essence of Tokay very rare.

The principal vine grown in Hegyalja is the Furmint, of which there are varieties, all thick-skinned fruit free from moulds and suitable for dried grapes. Amongst the varieties of Furmint are the following: Blanc, Muscat Jaune (which gives the celebrated Asszu de Muscat), Zef, Goat's Udder. They all ripen early; in good seasons some begin to colour at the end of July, and all are ripe in September. Qualities of wine are made in this district, from the ordinary Tokay, or the rare Essence.

Shrubby wines. — These are made from bunches containing no shrivelled grapes, or from which the shrivelled ones have been removed; although ordinary table wines, they have a very rich flavour.

Essence of Tokay. — The shrivelled grapes are gathered separately and in a vat having a small outlet at the bottom; through this flows very concentrated juice, obtained by the pressure of the grapes themselves.

This juice gives the Essence of Tokay, which is very rich in sugar, contains little alcohol; in time it takes on a very marked aroma and exquisite flavour; it is always rare.

Szsu wine. — This is the best-known of the Tokay wines, and is much rated as a dessert wine. It is prepared from a mixture of shrivelled and unshrivelled grapes; the greater the proportion of the former, the richer the wine. For a very sweet wine, 5 hottes (2 to 3 $\frac{1}{2}$ bushels) of shrivelled grapes are added to one barrel (28 to 30 gallons) of must. Asszú wines are made according to the number (2, 3, 4 or 5) of hottes of shrivelled grapes added to each barrel of must. The shrivelled grapes are first of all trodden alone in vat and the resulting mass is thrown into another vat, with the correct amount of must and stirred vigorously; it is set for 12 to 48 hours according to the temperature, after which it is put into bags, trodden, and pressed; then the juice drawn off is put into casks. *Ordítás.* — The residue from the bags is placed in another vat and a quantity of common must is added. After thorough mixing, the mixture is left together for 4 or 5 hours, and is then put into bags and trodden. The residue is then pressed and a liquid obtained which produces a very fine but of less value than Asszu.

Szamorodni Wine. — This is prepared from bunches whose grapes are only shrivelled; they are trodden in bags and treated in much the same way as for Asszu. The residue is used in the making of Ordítás.

Tisás wine. — To prepare this, good Hegyalja wine is poured onto the remaining lees after drawing off the Asszú or Szamorodni wines. In this wine the remaining lees is used to improve the ordinary table

Composition of the Must and the Wine. — Table I gives the composition of a sample of 1906 must (density = 1,113) from the vineyard of Tólcsva.

TABLE I.

	Grams per 100 c.c. of must.
Extract	29.41
Reducing Sugar { levulose	13.46
{ glucose	12.94
Total acidity (as tartaric acid)	0.80
Total tartaric acid	0.547
Acid other than tartaric	0.007
Cream of tartar	0.404
Tartrates of alkaline-earths	0.217
Ash	0.290
Phosphoric acid	0.069
Polarimetric rotation	12.12°

TABLE II. — *Composition of shrivelled grapes from the same vine in the same year.*

	per 100 kg.
Skins (moist)	5.633
Seeds	6.083
Water	6.083
Extract	63.550
Sugar { levulose	26.676
{ glucose	26.299
Extract (sugar free)	10.299
Total acidity (as tartaric acid)	1.605
Free tartaric acid	0.00
Tartar	2.281
Ash	1.681
Phosphoric acid (P ₂ O ₅)	0.148

Fermentation of the Must. — The fermentation of the must in the Hegyalja districts, is generally carried out in cold cellars, so that the of high sugar content ferment slowly. The wines are thus made slow to keep on improving in delicacy and aroma for years.

The Asszú wines of Tokay vary in colour from golden yellow to brown. They have a peculiar sweetness resembling that of honey, and very characteristic flavour and aroma. The Szamorodin wines are generally not or only slightly so; they have considerable strength, a yellow or yellow brown colour and a very characteristic flavour. They contain 13 per cent. of alcohol, while the Asszú wines, being much sweeter, only 10 to 13 per cent.

Comparison of the wines of Tokay with those of Sauternes. — This gives the analyses of representative types of the wines of Tokay and a us to make comparisons with the white wines of Sauternes made different methods.

TABLE III.—Composition of wines of Tokay (*Kramszky*) in grams per 100 c.c.

	Ordinary wine of Tokay-Hegyalla from Tarczal, 1902	Sauvignon from Sarospatak 1902	Ascert wine (ghosts) from Tarczal, 1901	Ascert wine (ghosts) from Tokay, 1898	Essence from Tokay, 1901
t: Volume per cent. .	14.39	14.77	12.23	13.13	7.11
.....	11.42	11.72	9.70	10.42	3.64
, total (C ₄ H ₆ O ₆) .	0.76	0.94	0.96	0.62	1.23
, volatile (C ₄ H ₄ O ₆) .	0.13	0.10	0.15	—	0.21
, fixed (C ₄ H ₆ O ₆) .	0.60	0.82	0.77	—	0.97
t	3.16	7.78	18.74	9.26	33.73
ing bodies	0.29	2.60	13.40	5.75	25.77
se	0.16	1.82	6.85	2.88	13.90
ac	0.03	0.68	6.45	2.77	11.87
me	1.08	1.48	1.80	—	1.45
ic acid, total	0.28	0.19	0.19	—	0.15
ic acid, free	0.08	0.00	0.00	—	0.00
tes of alkaline earths, .	0.07	0.16	0.13	—	0.05
.....	0.16	0.04	0.09	—	0.13
.....	0.02	0.015	0.03	—	0.024
.....	0.16	0.185	0.24	0.20	0.30
boric acid.	0.028	0.042	0.062	0.045	0.041
metric rotation . . .	—0.14°	—1.38°	—3.15°	—1.30°	—7.04°

Comparison of the Tokay wines with those of Sauternes.—The analyses of various wines allow a comparison to be made between those of the district in general and the famous white wines of Sauternes, of which method of preparation is quite different. Table IV contains analyses of the types making a series as similar as possible to the Tokay series in acid and alcohol content. The figures refer to 100 c. c. of wine. No. 5 is a "head wine", harvested under conditions quite analogous to those of the Essence of Tokay, and made from over-ripe grapes without any

TABLE IV.

	No. 1.	No. 2.	No. 3.	No. 4.	5.
Alcohol, volume per cent . . .	14.8	13.8	13.8	12.9	6
Reducing sugar	0.550	2.630	7.140	14.070	38
Extract at 100°	2.320	5.780	10.300	19.620	-
Extract, reduced.	1.840	3.250	3.260	5.650	-
Acidity, total ($C_6H_4O_6$) . . .	0.682	0.787	0.750	0.550	8
Acidity, volatile ($C_2H_4O_3$) . . .	0.050	0.070	0.080	0.085	-
Glycerine	11.465	1.465	1.815	2.450	0
Proportion alcohol-glycerine . .	3.080	13.270	16.440	24.020	13
Cream of tartar	0.118	0.115	0.140	0.135	-
Ash.	0.325	0.455	0.500	0.500	5
Rotatory Power	— 1	— 1	— 31	— 73	-

appreciable action of *Botrytis*, that is simply shrivelled. (1) No. 4 is a "wine harvested in the same year with a very pronounced development of the fungus. Nos. 2 and 3 are "middle" wines and No. 1 a "tall" wine of good years.

Comparing the figures of the two tables, it is seen that in the Sauternes wines with equal or higher sugar content, the alcohol content is greater than in the Tokay wines; the initial sugar content of the must therefore have been greater also; for No. 5 this figure works out at 51 per litre, whilst for Essence of Tokay it is about 370 gms., or about the same as Sauternes wines from grapes attacked by *Botrytis*.

The fact that the fermentation goes equally far, and sometimes further at Sauternes than at Tokay, in spite of the excess of sugar, is probably due to the warmer autumn in the Gironde.

The acidity of the two wines shows little difference, but it is slightly somewhat less in the Sauternes. This is chiefly a question of the variety, though increased by the neutralizing action of the *Botrytis*.

In both cases the reduced extract is very high, and glycerine is a considerable part of it. The proportion of glycerine per 100 of wine varies from 10 to 25 and this ratio varies directly with the quality of the wine, except in the case of exceptional wines like Essence of Tokay.

(1) The year 1893 was very dry right on to September, and the *Botrytis* did not appear by the time the grapes for this wine were gathered.

The writer explains the large amount of glycerine in Sauternes wines, firstly the presence in the must of ferments capable of producing considerable quantities of glycerine, especially when acting in very concentrated musts; also because, before fermentation begins, more than 1 per cent. glycerine is found in the musts, which must have been produced by the action of *Botrytis cinerea* on the sugar of the grape.

The Tokay wines are richer in tartaric acid than the Sauternes, because they are more alcoholic, and *Botrytis cinerea* neutralises some of the acidity of the fruit.

A more obvious difference exists between the ash contents, those of Sauternes being twice as great as the Tokay figures. One of the most important influences in this direction is the concentration of the juice of grapes attacked by *Botrytis*, which is greater than when they are simply pressed.

Again a very noticeable difference is accounted for by the use of sulphuric acid. The sulphurating of the stock is an indispensable operation in the vinification of Sauternes; and it is owing to the presence of sulphurous acid that the wines acquire and retain their wonderful properties. The addition of sulphurous acid to the Tokay wines in sufficient quantity would cause serious inconveniences, since the development of the aroma in the wine is dependant on energetic oxidation, which would be hindered by the presence of sulphurous acid.

Of the French wines, those of Monbazillac have most resemblance in taste and colour to the wines of Tokay.

- Influence of Ferments on the Variations in Dry-Extract and Glycerine in Wine. — VENTRE, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 4, pp. 304-307. Paris, July 28, 1913.

During a course of researches carried out with the object of ascertaining the action of some elliptical ferments on the general constitution of wine, the writer was surprised to find that the ferments do not all behave in the same manner towards the extractives of grape must. His experiments lead to the following conclusions :

1) Every ferment has a specific action on the extractives contained in must. Some, the Champagne ferment in particular, seem to produce a visible diminution in the dry extract, comparable with the dilution produced by certain ferments in brewing. The Médoc ferment on the contrary always gives a greater proportion of dry extract, without there remaining any consequence non-utilized reducing matter in the medium.

2) It would be interesting to know the variety of yeast which has transformed a must into wine, especially for research in adulteration by addition of alcohol; it would suffice if this attenuation of the dry extract corresponded to a high degree of alcoholic strength for the wine to be detected as one containing added alcohol.

3) The addition of sulphurous acid to the must diminishes to a great extent the attenuating power of certain ferments, especially that of Cham-

The writer proposed to investigate the cause of this diminution of extract and was led to determine the glycerine, with the following result:

a) Glycerine of organic origin is closely dependent on the ferment acting on the medium. The proportion of glycerine formed varies between 3.6 and 4.1 per cent. of the initial weight of sugar in white wines, and between 3.6 and 4.2 for red wines.

b) In media to which sulphurous acid has been added, the quantities of glycerine produced were sensibly the same in all the experiments, whatever ferment was used. The proportion varied between 3.53 and 3.7 cent. for white wines and 3.5 and 3.68 for red wines.

c) The variations of glycerine in the same medium are, according to the author's experiments, less than those found by M. Laborde, who reported considerable variations, according to the ferments, namely 2.5 to 7.7 cent. of the weight of transformed sugar.

1904 - **Plum Brandy. Improvements in its Manufacture.** — ELLRODT, G. in: *Zeitschrift für Spiritusindustrie*, Year XXXVI, No. 30, pp. 373-374 + 2 figs.

July 24, 1913.

Plum brandy is manufactured in the Southern States of Germany chiefly by small farmers who frequently possess only small badly equipped distilleries.

The raw material consists of the fruit of different varieties of plums (Zwetschen or quetsches, fruits of *Prunus domestica* and *P. amica*) and also the different varieties of round plums (Pflaumen). The quality of the product depends chiefly on special aromatic substances in the fruit, on the content of amygdalin and on the method of preparation. The content of sugar, the most important constituent in distillation, varies according to the variety of fruit and the degree of maturity. According to Körner it varies between 6.44 and 25.62 per cent. and averages 14.4 cent. The yield of alcohol varies considerably in consequence, and on account of different methods of manufacture, which in some districts have remained unchanged for a century. The fruit is generally crushed, stones being left intact in two-thirds of the mass, crush the other third. In several districts however this last operation is practised.

The crushed fruits are placed in barrels or cement troughs and covered by means of the ferments adhering to the fruit to ferment spontaneously. Lactic and acetic acid bacilli also develop in the mass and may check the development or even destroy the natural ferment by an excessive production of acid. The result is that the fermentation of the sugar is incomplete and that a portion of the alcohol is transformed into acetic acid if the fermented mass is kept any length of time.

Experiments have been made to accelerate the fermentation by addition of beer yeast and to check the bacterial action or diminish its effects. All these experiments gave increased yields of alcohol, but the quality of the final product was inferior to that produced by normal fermentation.

Some distillers have used compressed yeast. Better results might be obtained by the use of wine ferments in place of beer yeast either or compressed.

The enormous loss of alcohol which may result from spontaneous fermentation has been ascertained by experiments made at the Distill-Institute ("Institut für Gärungsgewerbe") at Berlin. The distillers brought material to the Institute complain that the yield of alcohol was exceptionally small without apparent reason.

It was found that a good deal of fallen fruit was used in the preparation of the must, with the result that a much greater number of micro-organisms were introduced into the liquid, thus increasing the danger of fermentation.

Analysis of the must gave the following results.

TABLE I.

Density of fermented must	6.6° B.
Acidity	5.46°
as acetic acid	1.658 gm. in 100 c. c.
Alcohol in filtrate	5.1 per cent. by volume
Unfermented sugar	0.6 per cent.

Calculating the quantity of acids corresponding to 100 c.c. of alcohol, an exceptionally high figure of 32.11 gms. is found. Allowing for the acid already present in the sweet must, which is not inconsiderable, remains a loss of about 20 per cent. of the total sugar due to the action of acid.

Microscopic examination showed that the lactic and acetic acid organisms were numerous and fully active and that the ferment had been dead some time. To the loss of alcohol due to fermentation, the loss due to distillation must probably also be added, because in some cases the apparatus used was very defective and often without an agitator. In this case, in order to prevent the fermenting mass from sticking to the walls of the still and burning, it is necessary to open the still in order to stir up the contents, which results in a considerable loss of alcohol. The means of determining the end of distillation is often so unsatisfactory that frequently alcohol remains in the residue.

Considering the high acid content of the fermented must, the writers asked the distiller for samples of the first distillation (crude product), of the second distillation (rectified) and tailings of the refined product (de vie fine). The analyses are given in Table II below.

These results show that only a very small proportion of the enormous quantity of acid in the fermented must passes into the rectified product. If the fermented must contains 36.04 gms. of acid per 100 c. c. of

TABLE II

	Eau-de-vie crude	Eau-de-vie rectified	Tally
<i>Results obtained:</i>			
Specific gravity at 15° C.	0.978 226	0.927 230	0.980
Percentage of alcohol in volumes determined with the alcoholometer %	17.7	54.36	15.8
Acids, as acetic, in 100 c. c. gms.	0.216	0.066	0.11
Index of total ethers.	20.1	38.3	6.6
» volatile	18.6	38.3	6.6
» fixed	1.5	—	—
Hydrocyanic acid, free. mgm.	traces	0.75	0.1
» » combined	1.25	2.50	—
» » total	1.25	3.25	0.3
Furfural reaction	present	present	present
<i>Results calculated per 100 c.c. of absolute alcohol:</i>			
Acetic acid gm.	1.121	0.121	0.81
Index of total ethers.	113.5	70.04	39.1
» » volatile	105.0	70.04	39.1
» » fixed	8.5	—	—
Hydrocyanic acid, total mgm.	7.06	5.97	3.26
» » combined	7.06	4.59	—
» » free	—	1.38	3.26

alcohol, the crude spirit contains 1.40 gm. and the rectified spirit 0.121. Of the ether which has passed into the crude product, none of the ¹ substance and only a portion of the volatile, passes into the rectified liquid. Only combined hydrocyanic acid is present in the crude spirit and a small quantity of the free acid in the rectified product, and the free acid alone in the tailings. This suggests that a hydrolysis of cyanide compounds takes place during rectification, and explains why different

sigators have not been able to demonstrate the presence of free cyanic acid in plum brandy, because the quantity probably depends on the degree of rectification to which the liquid has been subjected. In conclusion, only a small part of the great quantity of acids produced by the organisms during fermentation finds its way into the rectified brandy. There is no definite ratio between the formation of ethers and that of acids. In avoiding the development of acids by means of pure ferments, as is now practised of late, there is no risk of producing an inferior brandy. It is probable that the use of pure ferments of superior wines (which give to their products a fine characteristic aroma) would improve the quality of the brandy: at any rate the yield would be considerably increased.

PLANT DISEASES

GENERAL INFORMATION.

1205 - The First International Conference of the "Defensa Agricola" at Montevideo (1). — Conferencia Internacional de Defensa Agrícola. — Repúblicas Orientales Uruguay, Revista del Ministerio de Industrias, No. 1, May 1913, pp. 77-84, 14 Montevideo, 1913.

On the initiative of the Government of Uruguay, the First International Conference of the "Defensa Agricola" was held at Montevideo in May 2 to 10, 1913. The Ministers of Foreign Affairs and of Industries of the Republic were Honorary Presidents (their delegate, Dr. Ed. Acea being Acting President). The following States of South America were represented by their delegates and by experts: Argentina, Colombia, Chile, Paraguay, Brazil, Ecuador, Bolivia, Peru and Uruguay.

The text is given of the three Conventions drawn up by a technical commission and approved in final form by the International Conference. The first Convention consists of 15 articles, and deals chiefly with the damage caused by the locust *Schistocerca paranensis*. It arranges for an International Commission to be held before August 25 at Asunción, Paraguay. The objects of the latter are to study the centres of distribution and the concentration and diffusion zones of this locust and to propose (if it appears necessary after a preliminary enquiry) the creation of a Central International Station with sub-stations for the purposes of *a*) determining geographically the concentration zones of *Schistocerca paranensis*; *b*) elaborating and presenting a control system suitable for the concentration zone, and (after the acceptance of this system) the directing of the necessary operations; *c*) informing all the countries interested of the movement of the swarms in order that they may take the necessary measures; *d*) drawing up and distributing frequently to the respective Governments reports on operations carried out, and upon everything which can be tried for the destruction of this injurious insect.

Matters relating to the pecuniary assistance and the reciprocal collaboration of the various contracting States were also settled, in so far as these concerned the working of the International Commission, the four

(1) See also No. 183, B. Feb. 1913.

nd work of the Stations, the carrying out of a common control system, rganisation of a service of telegraphic information respecting the tions of the locusts, and the exchange of information at the close of season.

By the provisions of the second Convention, which consists of 10 es, the contracting States undertake to establish inspection services eir respective territories for the purpose of defending the interests of ulture against plant pests. The latter are defined as follows : para- weeds, injurious birds and other animals, and all causes of patholo- conditions, or of injury caused by cryptogams, insects and other als, when they have assumed or threaten to assume a propensity for iding likely to cause serious damage to plants.

As a result of the creation of the above-mentioned services, and for purpose of the export, import and transit of agricultural produce, states undertake to declare which ports are open to such importation and the measures of control to which these products will be subjected ; undertake to authorize no despatch of goods to the signatory tries, unless the prescriptions of the inspection services of the said tries have been carried out, and only to accept certificates given ficial agents. The States will advise one another as to the officials onized to issue such certificates, and respecting any modifications changes in the latter. These certificates should contain a declaration the original plantation or nursery is free from disease, and give the e of the owner or occupier of the land, its situation, the number species of the p'ants, the port of loading and unloading and the name 'dress of the consignee.

urther, the States are expected to communicate to one another the and regulations on the inspection service and any modifications of me, likewise the existence and development of diseases, the occur- of new diseases, and the disappearance of those already known, as is every occasion of the refusal or destruction of imported products, ; the origin of such products, and the reasons necessitating the its in question.

he second Convention also fixed that the second International Confe- of the " Defensa Agricola " should be convoked and organised by the tine Government, and held at Buenos Ayres. In conclusion, it provi- r the installation at Montevideo of a permanent International Bureau, (icina "), entrusted with the supervision of the execution of the deci- made, and to serve as an intermediary between the different bneaus Officinas tecnicas de Defensa Agricola " of the various adhering coun-

This Bureau will consist of an agricultural engineer chosen by Uruguay Government, and of diplomatic representatives of all the tries of South America already accredited to the Government of that blic. The working expenses will be divided proportionally among contracting countries. The directing Committee of the Bureau will up the regulations.

The third Convention announces in the text that: On the denunciation or request of any one of the Governments, the other contracting countries shall be obliged to take prohibitive measures against the importation of easily-propagated diseases which are unknown in the proclamatory countries, and this so long as they occur in the said countries and provided there are no practical measures of efficaciously disinfecting the substances which may convey the said diseases.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

1206 — The Cause Determining the Chlorosis of American Vines and the Method of its Control. — ACCARDI, SALVATORE. *La clorosi delle viti americane, 10* Naples, 1913.

Chlorosis, especially in the case of American vines, may be transitory if it depends on cultural defects, or permanent, if it is due to the composition of the soil. Temporary chlorosis may be treated by abundant manure. Permanent chlorosis, in the opinion of the writer, should be mainly attributed to an insufficient absorption of magnesium on the part of the plant.

Magnesium is not wanting in any soil, but the carbonic acid circulating with the water in the soil dissolves with difficulty the double carbonate of magnesium and lime (dolomitic). When the magnesium occurs in form, if any plant has not the power of directly decomposing this compound by means of the acid contained in its roots, it is deficient in the amount of magnesium necessary for the formation of its chlorophyll; hence development of chlorosis.

The analyses made by Averna and Rossi show that Berlandieri its hybrids contain more acid than Rupestris and Riparia, and also the Berlandieri group has a greater power of decomposing the double carbonate of lime and magnesium than that possessed by other American vines. It is to this circumstance that it owes its chlorosis resistance (1).

Since however, according to Comes (2), nitrogenous substances in general, and manure in particular, diminish the acidity of the sap by taking a larger amount of oxydases, especially in warm soils, it follows that soils which produce permanent chlorosis must never be treated with kind of nitrogenous manure. Phosphates (which maintain the acidity) should be used, together with such quantities of magnesium as are necessary by local experiments.

In conclusion, it should be noted that though ferrous sulphate is a useful remedy for temporary or transitory chlorosis, it is of little use in the case of permanent chlorosis, owing to its weak action in dispersing magnesium on being applied to the soil, and its slight and momentary catalytic effect when it reaches the chlorotic leaves.

(1) See No. 493, *B.* March 1912; No. 788, *B.* July 1913.

(2) See No. 881, *B.* July 1913.

- On the Presence of Endocellular Fibres in Healthy Vines and in those attacked by « Bramble-leaf ». — MARELLI, Eva in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Series 5, Vol. XXII, First Half-year, Part 12, pp. 879-883, Rome, 1913.

In this preliminary note, the writer, basing her remarks on the results of studies made upon healthy and infected American and European vines, states that the presence of endocellular fibres, which is considered by Petri as the "constant index" of the "bramble-leaf disease" ("roncet" or "ronqué", etc.) is not in her opinion "a symptom which is closely connected with the actual cause of the disease". Such fibres occur frequently, according to the writer, in healthy American and European vines, as well as in conifers and other plants, as has been demonstrated by Sanio, Müller, Raatz and Penzig.

In healthy vines, the writer states, the endocellular fibres occur equally in the higher and lower portions of the plant, and are found as frequently in the lower internodes as in the upper ones; while according to Petri these anomalies occur in the upper internodes only in plants which "have long been affected", and "when the fibre formation takes place at the same time at the summit and base of the plant, the injury is more and more serious".

BACTERIAL AND FUNGOID DISEASES.

- Recent Researches on Vine Mildew (*Plasmopara viticola*). — Communicated by Dr. Gy. DE ISVÁNYI, Professor at the University, Director of the Royal Hungarian Ampelological Institute, and Gy. PÁLINKÁS, Assistant.

Development of mycelium and conidia. — The germinating tube of the spores of *Plasmopara viticola* always penetrates the green parts of the leaf through a stoma; in the cavity below the stoma the hypha swells considerably and the whole of the protoplasm collects in this swollen part: a secondary spore thus produced soon throws out a haustorium, which invades the nearest cell of the parenchyma, and then develops a narrow tube (3 to 5 μ), which ramifies in the intercellular spaces and produces haustoria. By the third day a definitive mycelium is formed. As the pores send out hyphae which penetrate several stomata, each "grease spot" is caused by as many young mycelia as the zoospores which succeeded it. The growth of the hyphae is generally in a radial direction, but obstructions such as vascular bundles are met with by a flattening out of the hypha and the development of narrow hyphal threads which pass either above or below the vein and continue their way as before.

The mycelial threads may take the form of 1) cylindrical tubes, sinuous and narrow-walled; 2) vesicular tubes with irregular swellings (during damp weather: coraloid type); or 3) slightly flattened tubes often tapering and

) See No. 968, B. June 1912; No. 1349, B. Sept. 1912; and No. 67, B. Jan. 1913 [Ed.].

with irregular dichotomous branching. The hyphae are always septate and never join together. The nuclei (1.5 to 3 μ) are numerous and scattered irregularly; they form clusters at the bases of the branches and the tips of the young hyphae. Generally they are round, but when developing rapidly they become fusiform in shape.

The haustoria occur irregularly and are sometimes united in groups. Haustoria with long pedicels were previously unknown. They also possess a nucleus, which ultimately divides.

After the mycelium has developed, it sends out smaller filaments in the stomatic chamber, which form conical masses and raise the surrounding tissue. Under favourable conditions (heat and sufficient moisture) thin filaments from these hyphal masses pass out through the ostiole of the stomium and become swollen and present the appearance of young conidiophores, either 1) isolated, 2) joined together in a strawberry-like mass, or 3) with the extremities forming pear-shaped swellings which give rise to conidiophores. When these filaments begin to extrude, the nuclei advance in quantities, and the dense protoplasm containing them passes into the branches.

After a short period of growth a slight swelling appears just below the tip, and into it the protoplasm condenses. At the time of migration the nuclei are in a rapid state of division and are fusiform, elongated or hour-glass shaped. In the course of the development of these swollen protuberances (which represent the stems of young conidiophores), appear first primary and later secondary branches which terminate in trifid sterigmata. (At the base of these branches we have observed finger-like bodies, hitherto unknown, which are probably anastomosing sterigmata). Fructification begins immediately, the first conidium forming after 4 to 6 hours on the sterigmata of the lower branches. Under favourable conditions fructification is completed within 10 or 12 hours.

We have observed by staining that the first protoplasm to pass into the sterigma to the young conidium is not very dense; it is followed by a denser part, generally containing the nucleus. This nucleus then divides several times. In the development of the conidia there are three distinct periods: 1) the conidium has reached its full size and the nuclei begin to divide, though the conidium is not ripe; 2) after 3 or 4 hours from the appearance of the young conidia karyokinesis ceases; the conidia are now ripe and if placed in water cannot produce zoospores for a long time; 3) the protoplasm takes the form of a network, the nuclei take up definite positions and the conidia become fully matured. These facts account for the variation in virulence and the numerous differences recorded by various observers concerning the liberation of the zoospores.

The practical importance of this is that the conidia only become virulent after a period of about 24 hours. Thus it follows that the conidia produced in the morning after evening rain, cannot produce infection until rain also falls during the afternoon or night following. Thus fresh infection may be avoided by spraying immediately. With a mist the conidia may begin to germinate even before dropping from the conidiophores, which explains why mists are so harmful.

We have already (1911) described the cover or lid of the conidium. On germination this lid is forced up by the zoospores, which then effect escape.

At a temperature of 6° to 8°C. they maintain their vitality for 3 to 8 days, but do not survive drought for more than 5 days; dry weather following abundant rain is particularly destructive of thin-walled conidia.

In studying the effect of copper salts, we find, 1) that a solution of 10,000 of copper sulphate hinders germination, but that the conidia can survive in a solution three times as concentrated as that indicated by Det and Gayon; 2) that in the most dilute solution the formation of spores is considerably retarded (as much as 12 hours).

In artificial media the development of zoospores ceases at the time of germination from the conidia, which has been observed to take place after 24 hours in the different solutions employed (bouillon, sweet wort, liquid manure, hay extract, etc.), diluted from 5 to 10 times.

2. *The period of incubation.* — This is defined as the period between the germination of the zoospores and the appearance of the first symptoms of the disease on the plant (grease-spots on the leaves; yellowish-brown spots on the stems, tendrils, etc.).

The length of the incubation period depends on the temperature and humidity of the surroundings; for leaves it diminishes as spring advances; at the beginning to the middle of May it is 15 to 18 days; at the end of May 12 to 15 days; at the beginning of June, 11 to 13 days; at the middle of June, 9 to 11 days; at the end of June, 6 to 7 days; and in July and August 5 to 6 days, provided the weather is normal.

In the bunches the duration of incubation varies as follows: from the beginning of May to the beginning of June, 12 to 14 days; at mid June, 9 to 11 days; at the end of June, 10 to 12 days; in July 12 to 14 days. It is longer than 5 days if the infection takes place on the stalks of the grapes or on the main stalk of the bunch, as in this case the mycelium has to traverse the intermediate tissues, so that in July the period of incubation may be from 18 to 19 days.

During warm weather the incubation period may be so much shortened, especially if there is abundant rain, that the grease-spots do not show before the mildew is out. In this case the period of incubation on the leaves is 10 to 12 days at the end of May, 8 to 10 days at the beginning of June, 6 to 8 days from mid June to the end of the month and 4 or 5 days in July and August; on the branches it is 9 to 11 days in the first half of June, 7 to 9 in the second half and 8 to 10 days in July. In such cases the vine growers believe that the infection takes place during the rain on the day previous to the appearance of the mildew. This idea is erroneous, as infection always takes place 4 to 6 days sooner, and rain immediately before the appearance of the symptoms of disease has only the effect of reducing the period of incubation.

3. *Grease spots.* — These are the yellow or pale green transparent spots which appear on the green parts of the diseased plant immediately after the development of the mycelium, owing to destruction of the chloroplasts. On the fruits and old shoots the point of infection assumes a greyish or

brownish tint. The true "grease spot" appears along the edges and of the leaf.

The shape and size of the spots depends generally on the weather, variety and the growth of the leaves; in cold or wet weather the spots large and round; with drier weather they are smaller and more angular; on susceptible vines they are larger than on resistant varieties. After appearance of the spots the first rain starts the development of conidiophores which form the mildewed appearance on the diseased patches. The formation of the mildew is dependent upon the humidity; in dry weather it takes from 4 or 5 days to 12 or 20 for its appearance, and if there is no rain at night it may not appear at all.

4. *Infection experiments.* — All the young and green parts of the vine (including leaves half an inch in length) can be infected in the laboratory as well as in the open air. The success of the infection depends on the state of the plant, the virulence of the conidia and the local conditions. Infection can be produced on the surface of the leaf, but only along the larger veins and indentations. The susceptibility of the plant depends on the supply of water in the organ, the vapour tension in the stomata, the membranes and intercellular cavities generally, the turgescence of the cells, and to some extent on the chemical composition of the cell sap.

In June 1911 we carried out artificial infection experiments on bunches in the open air and described them in August of the same year, found that infection rarely takes place on fruits the size of a pea, but of a suppression of some of the stomata.

By means of conidia preserved for 3 weeks in an ice-room (at 6° to 9°) we have been able to cultivate the fungus throughout the winter on vine branches; by retarding the appearance of the mildew we have succeeded in preserving the mycelium in the "grease spots" in a latent condition during 7 or 8 weeks. Under suitable conditions of warmth and humidity the incubation period is the same under glass as in the open.

5. *Bearing of the incubation period on practice.* — Attacks of mildew take place after rain, thick fog or heavy persistent dew; the appearance of the mildew also occurs after rain; consequently the development normally depends on two rainfalls. It is therefore necessary to apply the sulphur at least after the appearance of the grease spots.

To detect the presence of the grease spots, before their appearance in the vineyard, the suspected leaves are first sprinkled with water and covered up and kept in a warm dark place. The bunches are wrapped in moist filter paper and placed in a warm damp chamber. After a few days the mildew breaks out on the suspected material and the disease is recognised.

6. *Use of the incubation calendar and trials.* — The grower should allow any appreciable rainfall (say half an inch) between the end of April and the beginning of May and allow for the incubation period 15 to 18 days, which gives the date of appearance of the grease spots due to infection from wind-spread conidia. He must also notice if the temperature falls below 10°C. (50° F.) as the disease cannot develop below this temperature. The artificial

should be made 5 or 6 days and again 2 or 3 days before the expiration date of incubation (with both leaves and fruits).

In calculating the date of incubation, only the rainfall of two or three duration may be taken together and the period must be reckoned from 1st day of rain. From mid-June onwards even small showers must be noted. Heavy showers are the most dangerous, and it is then that the vines require attention.

Conditions Favourable to the Development of Mildew. — MENGEL, O. solution du Mildew suivant les Conditions de Milieu. — *Comptes Rendus hebdomadiers des séances de l'Académie des Sciences*, 1913, Second Half-Year, Vol. 157, No. 4 (July 28, 1913), pp. 292-294. Paris, 1913.

From observations made in France it appears that infection by mildew : to a) general causes ; b) secondary causes depending on the nature itality of the vine, and on its adaptation to local conditions, such as the osition and exposure of the soil ; c) accidental causes (such as manure, e, drainage of the soil, etc.).

As the general causes are bound up with atmospheric variations, metrical observations are required to provide warnings and timely information. Preventive measures can always be successful in normal years as periods of infection do not overlap each other, as happened this year in Roussillon (Pyrénées Orientales).

For secondary and accidental causes, it is necessary to make researches the variations in the development of the disease. For example, the Chardonnay Grand-noir will remain free from disease though surrounded by the same variety badly infected ; and the Carignan of Salanque (1), growing in normal humidity, will be protected from infection by treatment with copper sulphate, owing to its adaptation to the local conditions, whilst the same variety of Carignan, growing in soil accidentally inundated, would require double the treatment.

Since the spores of mildew, like those of all Phycomycetes, are disseminated by the least breath of wind, one would expect to find them in great numbers to cause infection in any position. The writer has not evidence for believing that a district previously infected with the disease is not more liable to infection than any other, provided that the conditions previously favourable to the development of the disease no longer exist. Nor does he think that a hill-side situation is more liable to infection when it faces winds coming from previously infected areas. During the summer in Roussillon this year the prevailing winds during the infection period came from the sea and the most badly mildewed districts were precisely those which were exposed to these sea breezes almost free from contamination with spores ; this is accounted for by the writer as being due to the damp sea breezes accelerating the germination of the spores ; no doubt a rigorous treatment with the fungicide would have kept it in check. The vine-grower should therefore be acquainted with the modes of

action of these secondary and accidental causes and be able to act accordingly. It is well known that tillage during the period of infection is disastrous; consequently this operation must be postponed, or if urgent needed, a dressing of sulphate of copper must follow immediately behind plough. In manured vineyards it will be advisable to double the treatment or to partially defoliate the plants to let more air into the bunches. In this way the accidental causes are prevented from creating local conditions similar to those of the general causes.

1210 - Comparative Spraying Experiments with some Commercial Fungicides

— BRETSCHNEIDER, ARTUR. Vergleichende Versuche mit einigen Spritzmitteln gegen die Blattfalkrankheit (*Peronospora viticola* De Bary) des Weinstocks. — *Zeitschrift für den Landwirtschaftlichen Versuchswesen in Österreich*, Year XVI, Part 6, p. 713. Vienna, 1913.

In 1912 comparative experiments were carried out in various parts of Austria with Bordeaux mixture (1-2 per cent.) and the following commercial fungicides: "Floria-Kupferseifenbrühe" (3 per cent.), "Forhin" (1-2 per cent.); but the formula does not correspond with that given by the maker and "Perocid" (1-2 per cent.), chiefly against attacks of vine mildew (*Plasmopara viticola*), but also (at Znaim) against *Pseudoperonospora cubensis* on Cucurbitaceae and certain fungi on fruit trees (*Fusulina Monilia*, etc.).

The wetting power of all these preparations was found to be very important. The writer does not consider the visibility of the spray on the leaves important; for this point Bordeaux mixture comes first, followed in order of merit by "Floria-Kupferseifenbrühe", "Perocid", and "Forhin". For rapidity of preparation, the order is: "Floria-Kupferseifenbrühe", "Forhin", "Perocid". All the solutions were neutral and harmless to plants, with the exception of "Forhin" on one occasion, and they had the advantage over Bordeaux mixture in being ready for immediate use and not requiring testing for neutrality. They were also generally in a very state of division. Bordeaux mixture at 2 per cent. alone gave thoroughly satisfactory results in 1912 as a fungicide. With all the other preparations the mildew developed more or less vigorously. Arranged in order of merit with regard to their fungicidal properties they are as follows: Bordeaux mixture at 2 per cent., then at some distance Bordeaux at 1 per cent., "Forhin", "Floria-Kupferseifenbrühe" and "Perocid". The inferiority of the last-named mixture is due to the low concentration of the liquid. "Floria-Kupferseifenbrühe" and "Forhin" are the most expensive and "Perocid" the most economical in price.

1211 - Some Interesting Cryptogamic Diseases which Appeared in Hungary in 1912. — PÁRIZ, B. Mykologisches aus Ungarn. — *Zeitschrift für Pflanzenkrankheiten* Vol. XXIII, Part 5, pp. 260-262. Stuttgart, August 20, 1913.

The year 1912 was the most favourable for the development of cryptogamic diseases which can be remembered in Hungary. The writer carried out some researches at Klausenburg (Kolozsvár), records from place eight species of fungi, all interesting from different points of view.

| *Puccinia graminis* ; this appeared for the first time on rye, after the
had sought for it in vain for about 20 years ; the harm caused was,
er, not great.

| *Puccinia Malvacearum*, also observed for the first time, on marsh
v (*Althea officinalis*). It attacked, but only slightly, plants of one
age ; those from 4 to 5 years old were immune.

| *Epichloe typhina*, already recorded before 1912 as occurring on
ryum repens ; this fact is doubly interesting, because on the one hand
ngus had not yet been registered in the literature on the subject,
the other, the parasite proved useful in arresting the development of
ed preventing it flowering and fruiting.

| *Puccinia bullata*, very common on cultivated specimens of *Conium*
atum as in 1911 ; the uredospores appeared in May, and the teleuto-
during the second half of August, not only on the stems and leaves,
so on the inflorescences.

| *Plasmopora nivea* on the same plants of *Conium* ; wild individuals
; Umbellifer growing close to the cultivated specimens remained en-
immune, and as the latter were growing in rich well-manured soil,
ars that their excessive vigour rendered them more susceptible to
tacks of the disease.

Phoma foeniculina, very common on fennel, as in 1911 ; the infected
ore smaller and fewer seeds than the healthy ones.

Puccinia Menthae on *Mentha canadensis* var. *piperascens*.

Oidium quercinum on oaks ; these have been attacked by the fungus
yo ; the old trees were immune.

***Sclerotium Oryzae* on Rice in India.** — SHAW, F. J. F. A Sclerotial
ase of Rice. — *Memoirs of the Department of Agriculture in India*, Vol. VI, No. 2,
11-23, 1 fig., plates I-III. Calcutta, July 1913.

Sclerotium Oryzae was first described by Cattaneo in 1879 as damaging
Novara and Lombardy. It was discovered in Japan in 1910 by
and during the past year it has been found in various parts of India.
ected plants can be distinguished from their healthy neighbours
ormally prominent tillering, a fact that appears to have been over-
by previous workers. Later the infected culm gradually turns yel-
d dies and the ears are poorly developed and empty. Within the
stem at the base a dark greyish web of hyphae is visible with small
clerotia dotted over the surface.

le writer describes his preparations of the fungns in pure culture and
earance on various media. Inoculations of the pure cultures on ste-
dlings gave positive results.

le author concludes by pointing out the differences between his
tions and those of previous workers on allied species and draws
on to the interesting changes in colour and form of the hyphae grown
different media.

medial measures against such a parasite as this do not appear to be
able, and the writer suggests the breeding of resistant varieties as
y method of dealing with the disease.

1213 - *Lasiodiplodia Theobromae* parasitic on *Cacao* in Dahomey.
 BERTHAULT, PIERRE. Sur une maladie du Cacaoyer dans l'Ouest Africain. - *Annales Coloniales, Bulletin mensuel du Jardin Colonial, Nouvelle Série*, Year 4, N. pp. 8-14, figs. 1-3, Paris, July 30, 1913.

The cacao plantations in Dahomey have been ruined by a disease locally as "sun-stroke" or "apoplexy", which attacks the root, trunk, branches and destroys in a few days otherwise healthy and productive trees. As a result of his examination of the disease the writer concludes that it is due to a parasite, *Lasiodiplodia Theobromae* (Pat.) Griffon et Maubl.

He suggests experiments to test the efficacy of copper mixtures, lime-sulphur, and disinfection of the soil by carbon disulphide injection. Further studies on this subject are required.

1214 - "Soft Rot" of Bulbs of *Ixia maculata* and *Gladiolus Colvilli* produced by *Bacillus Ixia* n. sp. and *Pseudomonas Gladioli* n. sp.
 SEVERINI, G. Una bacteriosi dell'*Ixia maculata* e del *Gladiolus Colvilli*. - *Ann. Botanica*, Vol. XI, Part 3, pp. 412-422, plate VIII, Rome, 1913.

In April 1912, the writer observed a soft rot on bulbs of *Ixia maculata* and *Gladiolus Colvilli* resembling a bacterial disease. All the plants (in bulbs obtained from Holland), though grown in quite separate flats, showed signs of the disease simultaneously, at the time of appearance of first blooms.

The symptoms of attack begin with a yellowing of the tips of the leaves extending longitudinally to the base, and finally the whole leaf turns yellow. Livid purple spots then appear, quite distinct at first, but later char into a greyish black mass. The whole shoot is easily detached from the bulb, and may fall to the ground of itself. On superficial examination, the bulb appears normal, but within the outer sheath it is covered with yellow or reddish spots and is found to be flaccid and full of a soft granular mass. The disease attacks young bulbs equally with the old ones.

The writer has obtained pure cultures of the organisms present in diseased tissue, and out of five bacteria which he isolated he found that three were capable of producing the disease by artificial infection. One of these organisms occurred on *Gladiolus* and the two others proved to be one species capable of producing the disease in either *Gladiolus* or *Ixia*. From the organism from *Gladiolus* he named *Pseudomonas Gladioli* and the one common to both *Bacillus Ixia*.

The above organisms are capable of producing "soft rot" of the bulb and leaf sheaths. They are confined to the intercellular spaces of the parenchyma, where, by dissolving the median lamellae they produce a complete separation of the cells. They do not alter the cellulose walls or the starch grains, but the protoplasm is soon poisoned. *Bacillus Ixia* appears to attack the pectic matter of the median lamellae more vigorously, while *Pseudomonas Gladioli* exerts a greater toxicity towards the protoplasm.

(a) See also No. 316, B. Jan. 1911, and No. 616, B. Feb. 1911.

The writer also found that both organisms can produce the disease in plants, but that the power of adaptation is less with *Bacillus Ixiae*. Infection, under natural conditions, probably takes place through use of the bulbs, where the micro-organisms can readily gain entrance. Conditions necessary for the progress of the disease are a temperature of 30°C. and great humidity.

As preventive measures the writer recommends: a) using only bulbs from uninfected districts and storing them in a dry airy place; b) disinfection of the bulbs by plunging for 15 minutes in warm water at a temperature of 50° to 55°C. (122° to 130°F.); this does not hurt them, while the organisms are killed at 47°C. (117°F.); c) mould and pots that have been used near diseased plants should be discarded and the frame disinfected with formalin or lime; d) the plants must have a free circulation of fresh air, plenty of light, and not too much moisture.

- **Dik-voet, Club-root, or Finger-and-toe (*Plasmodiophora Brassicae*, Woronin) in South Africa.** — Port EVAES, I. B. in *The Agricultural Journal of the Union of South Africa*, Vol. VI, No. 1, pp. 93-97, plates V-VII. Pretoria, July 1913. This is the first report of the occurrence of this disease in South Africa, but it has undoubtedly existed during the past 10 or 15 years. The writer of the present outbreak in the Cape Province emphasises the importance of greater vigilance on the part of the farmers and of a more ready collaboration between the cultivator and scientific expert in the control of diseases.

Up to the present it has not been observed as occurring on turnips in South Africa, though this is the crop most frequently attacked in England. The particular outbreak appears to be nearly confined to cabbages and swedes.

The writer describes the characters of the disease and the usual preventive measures.

- "Ferrugem da pimenteira" (*Puccinia Capsici* n. sp.) on Various species of *Capsicum* in the State of São Paulo, Brazil. — AVERNA-SACCA, SARTORIO. — Ferrugem da pimenteira, *Puccinia Capsici* n. sp. — *O Fazendeiro*, Vol. VI, No. VII, pp. 258-259, 2 figs. São Paulo, July 1913.

Puccinia Capsici n. sp., which appeared for the first time in 1909, is a serious pest of *capsicums* in various parts of the State of São Paulo of different types of soil; plants in damp and shady situations are, however, most liable to the disease. Up to the present it has been recorded on *C. frutescens* (pimenta da China), *C. frutescens* (pimenta cumarim), *C. penduliflora* (malagueta), and *C. microcarpum* (pimenta cumarim miuda), but not yet on *C. grossum* (pimentões); it is probable, however, that the latter is equally susceptible, because harder and consequently more resistant varieties like those above mentioned are not immune to the disease.

This fungus attacks all parts of the plant; on the stalks and branches of 11 years' growth it produces fruiting pustules, resulting in lesions and atrophy of the parts affected. The terminal buds are attacked most

severely and become deformed and shrivelled. The leaves become covered with distinct spots, corresponding to fruiting bodies on the undersides; they soon curl up and eventually wither. The flowers are also attacked particularly on the peduncle and calyx; attacks on the peduncles occasion loss of fruit.

1217 - A Die-back Disease of Douglas Fir produced by a Variety of *Sphaeropsis Ellisii*. — PETRI, L. in *Annales Mycologici*, Vol. XI, No. 3, pp. 175-176, figs. 1-3. Berlin, 1913.

In the spring of 1912, a large number of Douglas firs, which had been planted 5 to 7 years ago in fresh sandy soil protected by a cover of Scots pine at Grezzano nel Mugello (Tuscany), at 1000 ft. above sea-level, showed a drying up of the tips of the branches. This drying up of the branches ended abruptly a short distance from the summit of the tree and at a point of separation between the dead twigs and the part still green a glistening could be detected, which spread into the cortical tissues. When kept in a moist chamber, pycnidia developed and the fungus was identified as a variety of *Sphaeropsis Ellisii* Sacc., a species of fungus having no distinct forms identified by the host plant rather than by morphological characters.

The variety on *Pseudotsuga* differs slightly from the known variety of *Sph. Ellisii* in the dimensions of its spores, and approaches nearer the variety *Abietis*.

The writer has not yet obtained the germination of the spores in nutritive media.

The chief cause of the outbreak appears to be attributable to the position of the trees attacked; in spite of the south aspect, they have no sufficient light, and grow in an excessively moist atmosphere. At a distance of 50 yards, on the same soil, there are thousands of Douglas firs of the same age, but not shadowed by any other trees, and all are perfectly healthy.

Although direct observation has not yet been made, it is possible that the infection of the Douglas firs took place with spores of *Sphaeropsis* from the branches and cones of the *Pinus sylvestris*, and that the infection developed on the young trees owing to the special conditions of humidity and temperature.

Successful experiments to prevent infection have been carried out by spraying with a 1 per cent. mixture of lime and copper sulphate.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1218 - *Avena fatua* and other Species of *Avena*, with their Hybrid Weeds of Cereal Crops in France in 1913. — RABATÉ, E. La folle avoine. *Le Progrès Agricole et Viticole*, Year 33, No. 32, pp. 116-130, figs 1-5. Montpellier, August 10, 1913.

Avena fatua (the wild oat), with other wild annual species of *A. barbata*, *A. strigosa*, *A. sterilis*, *A. Ludoviciana*) and hybrids between these and *A. sativa* (the cultivated oat) — all known in France as

e" and common weeds of grain crops in the south-west and south of country — has been very prevalent in the crops this season, after a mild and rainy spring.

The losses to farmers have been very considerable. In some fields rain had to be cut green in early June to prevent the wild oat seeds shed.

From his own observations on some fifty farms, and from reports received, the writer considers that there are good botanical characters for distinguishing the seeds of *A. sativa* from those of the weed species, but the writer becomes hopeless for certain hybrids which are very close to the cultivated oats.

Severe winters destroy the weed species in large quantities.

The deep ploughings of 1912 favoured the great invasion of 1913. After deep work it is well to take either a spring root crop or a market-garden crop before cereals, as such a crop allows the wild oats to come up undisturbed, and they soon get destroyed by the repeated hoeings.

Ploughing the stubble after a very foul crop of wheat only induces the maturation of quite a few seeds of wild oats; the majority remain dormant in the soil for many years. Summer ploughing on over-dry land favours the development of wild oats in the grain crop following. On badly infested land, wheat and red clover ("trèfle violet de Hollande") must not be sown for several years; on such land smothering crops, such as rye, lupins, temporary leys, rape and mustard, should alternate with well tilled crops and green crops cut before the wild oats flower. On such land it cannot do better than after two cleaning crops in succession, either a cereal crop and a root crop, or two root crops.

Commercial oats containing grains of hybrids of weed species with them should be crushed before feeding to stock.

For control measures the writer advises: hand-hoeing in February or horse-hoeing of cereals in drills in February, followed by spraying 10 per cent. sulphuric acid; pulling up of tufts in April and May; cutting of the ears in early June; cutting green followed by ploughing; collection of chaff which may contain wild oats; and lastly firing the

INSECT PESTS.

Leucopis nigricornis, a Natural Enemy of *Pulvinaria camelliae*. — MALENOTTI, ETTORE. Sopra un nemico naturale della "Pulvinaria camelliae" Sign. — "Redia", Vol. IX, Part I, pp. 113-155. Florence, August 28, 1913. Some specimens of *Pulvinaria camelicola* collected at Ascoli Piceno (on the leaves of orange trees and forwarded to the Royal Station of Agricultural Entomology at Florence, were found to have deformed oviducts and the writer discovered this to be due to the presence of dipterous feeding on the eggs. The writer reared these parasites early in June and identified the fly as being *Leucopis nigricornis*, a species already re-

corded as a parasite of insects in Hawaii and the United States, but which is not very common and of whose habits little is known. It appeared in Italy at least, *Leucopis* had not before been recorded as a parasite, *Pulvinaria camelicola*.

1220 - *Aelia acuminata*, a Hemipterous Pest of Cereals in Algeria. — VERNET, P. Un ennemi de plus des céréales. — *Revue Agricole & Viticole de l'Afrique du Nord Algérie Tunisie-Maroc*, Vol. II, No. 71, pp. 644-646. Algiers, July 19, 1923.

During May and June, the grain crops (wheat and barley) in several districts of Algeria were reported to be attacked by an insect which pierces the soft unripe grains and caused them to dry and shrivel up in the ear. The writer identified the insect as *Aelia acuminata* (Hemiptera), which occurs normally on uncultivated land, but which in certain seasons multiplies rapidly and seeks food in neighbouring cornfields.

The writer recommends sowing the corn in separate strips so that the workman can pass between and collect the insects in a butterfly net; this way many insect pests can be collected and destroyed by burning. Gatherings at intervals of 8 or 10 days are generally sufficient to remove the bulk of the insects. The cost of collecting and burning the insects amounts to only about 4d an acre.

1221 - *Heterodera radicicola* on the Roots of *Scirpus sylvaticus* Silesia. — OBERSTEIN, O. Eine neue Alkengalle an den Wurzeln der Weiß-Segge (*Scirpus sylvaticus* L.). — *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, pp. 262-264, figs. 1-2. Stuttgart, August 20, 1913.

In the spring of this year, Dr. A. Lingelsheim found nodular and irregular swellings on the roots (chiefly the lateral ones) of *Scirpus sylvaticus* growing in the Botanical Gardens at Breslau. It was found that these swellings were due to the presence of *Heterodera radicicola* Greeff. This discovery is interesting because gall-like formations have not before been recorded on the genus *Scirpus*, and also because *S. sylvaticus* is a new host of this widely spread nematode.

1222 - The Hop Aphis in the Pacific Region. — PARKER, WM B. — *United States Department of Agriculture, Bureau of Entomology, Bulletin No. 111*, pp. 43 + 82 plates. Washington, May 1913.

The hop aphis (*Phorodon humuli*), known as a pest in Europe long before hop growing became an industry in America, is now a troublesome pest in most of the hop-growing sections of British Columbia, Washington, Oregon and California.

The writer gives the results of his observations and experiments made at Sacramento and Santa Rosa (California). From a series of observations on the biology of the insect and its relations to its host-plants (hop, peach, cherry, apple), he describes the life history as follows.

Two generations are produced on the hibernating host plant, the second of which is winged; five or six generations occur on the hop; some of the fifth generation are winged and give rise to the hibernating generation, whilst others remain wingless and give rise to a sixth generation of winged insects.

agent	Materials used	Pressure	Percentage killed.	Cost per 100 gals.
		Ibs.		
	Nicotine sulphate 1 in 3 000	80-100	99.9	\$0.416
	Nicotine sulphate 1 in 3 000; with whale-oil soap, 4 in 100	80-100	99.2	0.80
	Nicotine sulphate 1 in 3 000; with cresol soap, 1 in 300	80-100	95	0.83
	Tobacco waste, 25 lbs. to 100 gallons water	100	100	0.18
	Quassia 9 lbs., whale-oil soap 6 lbs., water 100 gallons	—	—	0.74

son the hop; these winged males of the sixth generation follow the ed females of the fifth generation, which produce eggs and give rise to the first generation the following spring. The eggs are laid on leaf or leaf scars.

The aphides live chiefly on the under side of the leaves and are only found on the upper surface during a bad attack; later they migrate to the hop cones. The spread of the attack is facilitated by ants (*Formica rufa* Say), which cultivate them for the honey-dew and carry them to the young shoots for fresh feeding grounds.

Damage to the hop plants is brought about in two ways: 1) by sucking the sap of the plant, and 2) by the growth of a black smut (*Cladosporium*) in the sugary secretion, which deteriorates the value of the harvest, rendering it worthless.

Amongst the natural enemies of the hop aphid are the following: *Podisma convergens* Guér., *Coccinella californica* Marnh., *C. abdominalis*, *Chilocorus orbus* Cas., *Chrysopa californica* Coq., *Syrphus opinator*, *S. americanus* Wied., *Triphleps insidiosus* Say, *Adalia bipunctata* L., *Iorus punctum* Lec., *Campobrochis nebulosus* Uhl., *Anthocoris* sp. In spite of these enemies the spread of hop aphid has never been adequately checked and contact sprays are generally adopted, especially decoctions of 1000 or quassia and whale-oil soap.

Spraying should take place in the springtime as soon as the aphides appear on the plum or other fruit tree, then again in the autumn to reduce the attack on the hops. Twice to four times is necessary in the autumn to keep down the numbers of the aphides, and each time the greatest care must be taken to reach both sides of the leaves. Very careful spraying has been known to save the crop from serious attacks.

Details are given of several experiments made with different insecticides and of the technique of spraying. Flour paste is specially recom-

mended in place of soap as being cheaper and quite inoffensive. It is made by mixing a cheap flour with cold water until a smooth thin butter is obtained. This is diluted until it contains 1lb. of flour to each gallon of water and is then cooked to a paste, sufficient water being added to make up to evaporation; when mixed with the insecticide the flour paste has a tendency to settle, so that constant agitation is necessary.

The table on the preceding page gives the most important mixtures for use with a compressed air sprayer.

From 300 to 500 gallons per acre are required and one machine will spray from 2 to 3 acres per day. The total cost of spraying 500 gals. per day of the nicotine sulphate flour-paste mixture amounts to \$6.79 per acre, whilst the quassia and whale-oil soap mixture amounts to \$7.25 per acre. Stripping the vines before spraying will cost from \$1.80 to \$2 per acre.

A bibliography of 34 works is appended.

1223 - *Aphrophora spumaria* on Roses and Pinks. — MOLINAS, E. *L'Aphrophora spumaria sur les oeillets d'Antibes*. — *Journal d'Agriculture pratique*, 1913, Vol. No. 31, p. 155. Paris, July 31, 1913.

Roses and pinks have been attacked this year at Antibes by the larvae of *Aphrophora spumaria* (Hemiptera), which reduced the foliage and caused the young shoots to turn yellow. As a rule the damage due to this insect is slight because the larvae appear only in small numbers and soon die out at the end of the season. The ravages of this pest are kept in check by hand-picking and dusting the plants with quick lime.

1224 - Painted Lady Caterpillars damaging Artichokes in France. — Tschulik, *Un parasite de l'artichaut*. — *Le Progrès Agricole et Viticole* (Edition de l'Est-Ouest), Year 34, No. 29, pp. 88-89, figs. 1-2. Montpellier, July 20, 1913.

The caterpillars of the Painted Lady (*Pyrameis cardus*), which is generally to be found on thistles and mallow in France, occasionally appear in artichoke beds, but its numbers are generally too small for it to be considered as a serious pest.

However, in the spring of 1913, large artichoke beds in the neighbourhood of Hyères were entirely destroyed in a few days by these caterpillars, which then invaded neighbouring plants, including a bed of French beans. Several insecticides were tried, but with little success. The writer suggests that the egg-laying should be carefully watched towards the end of April, and a suitable insecticide used to drive away the butterflies.

1225 - *Nysius senecionis* Attacking Recently Planted Vines (1). — PICARD, in *Le Progrès Agricole et Viticole*, Year 30, No. 30, p. 101. Montpellier, July 27, 1913.

This noxious insect (Hemiptera) is very abundant this year on young grafts in many localities in France. The writer recommends the treatment previously mentioned as being the most effective.

(1) See No. 1484, B. Oct. 1912.

- **Some Animal Parasites on *Prunus* in Provence.** — CORTE, J. in *Journal d'Agriculture pratique*, Vol. II, No. 34, pp. 243-244. Paris, August 21, 1913.

The writer has been studying the animal parasites deforming plants in Provence during the last two years and describes those which he has observed recently on *Prunus domestica* and *P. spinosa*.

Amongst parasites attacking the leaves (already recorded in other European countries) he mentions: a) *Eriophyes similis*, not widely spread causing little damage; treatment consists of severe pruning and removal of the leaves attacked later by the parasite: it is also kept in check by numerous enemies. b) *Aphis cerasi*, the commonest aphid on plums in Provence. c) *Myzus pruni-mahaleb*, occurs everywhere. d) *Hyalope pruni*. e) *Perrisia tortrix*, not frequent.

As a parasite on buds the writer cites another Cecidomyiid, *Asphondyli prunorum*, which, though long known, has been little studied. It occurs on plums, but is common on blackthorn, and the writer recommends the destruction of all blackthorn bushes infested with this pest in the neighbourhood of plum orchards, or at any rate their treatment with suitable insecticide.

- ***Melitomma insulare* and *Rhina nigra*, Beetles Injurious to Coconuts in Madagascar.** — VUILLET, A. Deux ennemis du Cocotier de la région Malagache. — *L'Agronomie Coloniale*, Year 1, No. 2, pp. 33-37, 1 plate. Paris, August 31, 1913.

The writer describes the life history of *Melitomma insulare* Fairm., its habits and means of combating it. (1). It occurs in the Seychelles and in the island of Beravia (north-west of Madagascar), where it causes serious damage to coconut plantations; it is probably distributed throughout the Madagascar region.

Rhina nigra Drury also occurs in Madagascar, as well as Beravia, where it gives much trouble. This beetle has been observed to attack trees early at a height of 5 feet, though they were already damaged at their base by *Melitomma* beetles. These observations do not agree with those of W. Urich concerning *Rhina barbirostris* (2). The eggs are laid in a cavity of the bark made by the female and the larvae very soon penetrate into the hardest portions of the wood where they bore numerous galleries.

Preventive measures are adopted against this parasite by covering all buds in the bark with coal-tar, and using a mixture of thick lime wash and lead arsenate (1 lb. of lead arsenate in 10 gals. lime wash) to destroy eggs laid on the tree trunks. At Beravia the eggs are destroyed by peeling the bark and the application of coal-tar. Trapping the insects by placing sections of decaying stumps in the plantations to attract the female, and destruction of the larvae by boiling water, might be done with advantage.

(1) See No. 2005, *B.* June 1911.

(2) See No. 1698, *B.* Dec. 1912.

1228 - Insect Injurious to Papaw Apples: *Dichocrocis punctiferella*.
JARVIS, E. in *The Queensland Agricultural Journal*, Vol. XXXI, Part I, pp. 13-14
Brisbane, July 1913.

A disease of papaya trees was reported from Cleveland in May, and was found to be due to a well-known insect pest, *Dichocrocis punctiferella*. Though primarily a maize pest, this insect appears to be extending its ravages to fruit trees, reports having already been received of its damage to custard apples, oranges, peaches, loquats, cotton and other fruits and seeds. The infested trees had their top leaves drooping or dead, their main stem defoliated, with small discoloured fruits hanging from the blackened crowns.

The full-grown moth measures about an inch across the expanded wings, which are pale orange-yellow with numerous dots. It appears at night and lays its eggs on the base of the leaf stalk or occasionally on the fruits. The larvae penetrate the stalk and bore their way to the crown where they pupate. A full-grown larva is nearly an inch long, dirty white in colour, and marked with rows of grey spots. Its head is dark brown, the first segment of a lighter brown colour. It pupates in a loose silken cocoon on the exterior of the crown of the tree.

The following preventive measures are recommended: 1) Spray with arsenate of lead (1 lb. to 50 gallons of water) in the form of a mist spray. This is directed principally against early broods and should be applied early. All trees, profitable or unprofitable, that are liable to be attacked in the neighbourhood should be sprayed. 2) Maize grown as a trap crop and destroyed immediately the grubs are approaching full size. 3) Destruction of all infested fruit, such as peaches, etc. 4) Avoid planting maize, except as a trap-crop, near orchards.

1229 - Deformation of the Flowers of *Fraxinus Ornus* caused by *Eriophyes fraxinella*. — SIRENA, CORLEO SIMONE. Alcune deformazioni del *Fraxinus Ornus* Malpighia, Year XXX, Part V-VI, pp. 512-517. Catania, 1913.

The author has observed certain peculiar gall-like formations on flowering branches of *Fraxinus Ornus* growing near Palermo. The growths appear here and there on long or more frequently short stalks, irregular shaped masses, somewhat flattened and lobed, of a reddish-brown colour, turgid and more or less glandular. According to the writer they represent floral axes, the numerous protuberances of which are small, deformed and aborted flowers surrounded by the rudimentary floral structures. In some of them a small circular depression is noticeable in the centre, corresponding, perhaps, to the receptacle, but no trace of the pistil is discernible.

These malformations are caused by an acarine pest, *Eriophyes fraxinella*, more commonly known as a parasite of the common ash (*F. excelsior*).

The writer has observed that these aborted floral receptacles secrete a sugary liquid which is devoured by ants. This is remarkable, since the flowers of *F. Ornus* do not normally secrete nectar; it may be accounted for by the great quantity of sugar occurring in the sap, especially in summer. Owing to the excessive turgescence of the swellings produced by this insect this sweetish secretion is exuded. It seems to be the first record of secretions from acarid galls.

